CR Bushfire.

7/40-42 Cassia Street
Dee Why NSW 2099
www.crbushfire.com.au

Morisset Place Strategy




High Level Bushfire Study

Prepared by: CR Bushfire Pty Ltd
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Executive Summary

The High Level Bushfire Study undertakes a risk assessment and mitigation strategy for the Morisset area of Lake Macquarie. The High Level Bushfire Study is required for the development of a Morisset Place Strategy and is informed by the Morisset Place Strategy Discussion Paper. The Bushfire Study looks at 12 sites within and around the existing Morisset urban area, along with investigation areas along the Morisset Peninsula and additional sites around the Morisset Hospital.

The principle methodology used within the High Level Bushfire Study is to drive any identified risk to "As Low as Reasonably Practicable" using risk treatment strategies. The study generally follows the guidance within Chapter 4 of *Planning for Bush Fire Protection 2019* but also incorporates other guidance where necessary and appropriate.

The landscape risk assessment conducted identifies significant bushfire risk within the surrounding landscape to the west and south of Morisset. Within any future development within these areas this risk will need to be mitigated. This may include the use of larger asset protection zones to take account of future climate conditions.

The general evacuation potential within the area is the biggest concern. The road network is already congested and would require a significant upgrade to be able to operate effectively in a bushfire emergency evacuation scenario. Adding additional people and residents into this already constrained traffic situation will increase the risk to the existing community and put any new residents at significant risk. There are also limited options for shelter or refuge and no Neighbourhood Safer Places in or around the study area.

Sites in the west of the study area are subject to the highest bushfire risk due to their westerly aspect and the significant amount of wet sclerophyll forest within the landscape to the west. Nevertheless, the access in this area is optimal as the sites are in close proximity to the M1 Pacific Motorway. Sites in this location are earmarked for agricultural and employment uses, which may be appropriate subject to detailed review of bushfire risk, evacuation potential in light of the number of people who may be situated within this area.

Site 11 in the south of the study area carries the greatest risk due to bushfire risk from the south and road network issues within Morisset. If residential development of this site is to be considered, it needs to be subject to a robust mitigation strategy. There are many fire trails within the landscape around this site, one opportunity may be to undertake a fire trail review with the NSW RFS in order to gain strategic advantage from the addition of registered fire trails within the landscape that can be used for mitigation and active fire defence. Without significant road network improvements and consideration of places to shelter or take refuge within this area, residential development should not go ahead.

There is also significant risk along the Morisset Peninsula and around the Morisset Hospital site. The risk is more discontinuous along the Peninsula but there are still areas of continuous vegetation that would be subject to significant fire risk. The addition of people within the Peninsula area may place greater strain on the road network and put existing residents at risk. May of the roads within the area are subject to bushfire risk. It is possible to move away from the risk, but there are limited options for shelter or refuge. For residential development to be considered within this area, it must be subject to a detailed review of the road network and bushfire risk.

The Lake Macquarie State Conservation Area is situated adjacent to the Morisset Hospital and the RU6 transition zone to the north of this site. The landscape risk around this area is significant and there is likely to be ecological conflict with bushfire protection. There is potential for occupants of these sites to become trapped due to their isolation within a heavily bushfire prone landscape. Residential uses should not be considered. Recreational uses may be appropriate subject to a comprehensive bushfire emergency management plan.

Overall, the Morisset area is subject to significant challenges with regard to bushfire risk and mitigation. Some of these challenges can be overcome such that development can occur, however, more detailed studies of each of the sites proposed for land use change will be required within the development of a detailed Place Strategy.

1. Introduction

This High Level Bushfire Study has been prepared to inform the development of a Place Strategy for the Morisset area. The study has been engaged by and informed by Lake Macquarie City Council as part of the background studies for the Morisset Place Strategy. This study has been funded by the NSW Department of Primary Industries and Regional Development.

1.1 The Morisset Locality

Morisset is situated at the southern end and western side of the Lake Macquarie catchment area, approximately 15 kilometres inland of the Pacific Ocean. The Central Coast Local Government Area is situated south of Lake Macquarie and the Newcastle Local Government Area is situated north of Lake Macquarie. The settlement is situated just inland of the M1 Pacific Motorway and has good access to the motorway heading both in a northerly and southerly direction. The population of Morisset is 4,078 and the town provides small industrial, commercial and retail employment opportunities.

Figure 1: Location of Morisset

Morisset forms part of the South West Growth Area under the Lake Macquarie City Local Strategic Planning Statement (LSPS). The South West Growth Area is seen as an area of opportunity for new affordable and diverse housing due to its position close to the M1 Pacific Motorway and Northern Rail Line. Morisset is seen as a Strategic Economic Centre under the LSPS based on these key transport connections. One of the actions within the LSPS is to commence a review of the Morisset strategic economic centre's landuse and transport planning framework.

The study area has also been extended beyond the Morisset catchment to the Bonnells Bay and Yarrawonga Park Peninsula, known as the "Proposed Extended Area for Place Strategy". This area is a fairly dense urban area with residential development situated around the edges of the peninsula. Access to the peninsula is via the Fishery Point Road.

1.2 Morisset Place Strategy

Morisset has been identified in the *Hunter Regional Plan 2041* as a Regionally Significant Growth Area. Morisset is situated within the "Central Lakes District", an area which is expected to receive an influx of population due to an increase in employment opportunities and proximity to Greater Newcastle. The urban growth is intended to be achieved by:

- Accelerating the number of homes and jobs in identified precincts;
- Planning for alternative land uses at former power station sites;
- Retrofitting suburban areas to enhance quality of life;
- Enhancing the blue and green grid;
- Promoting sustainable use of mineral and energy resources;
- Planning for the Morisset and Warnervale regionally significant growth areas.

The investigation areas for residential and employment areas identified within the Hunter Regional Plan are shown in Figure 1 below. These areas have since been updated by Lake Macquarie Council and the Figures used within this report reflect the advice provided by Council.

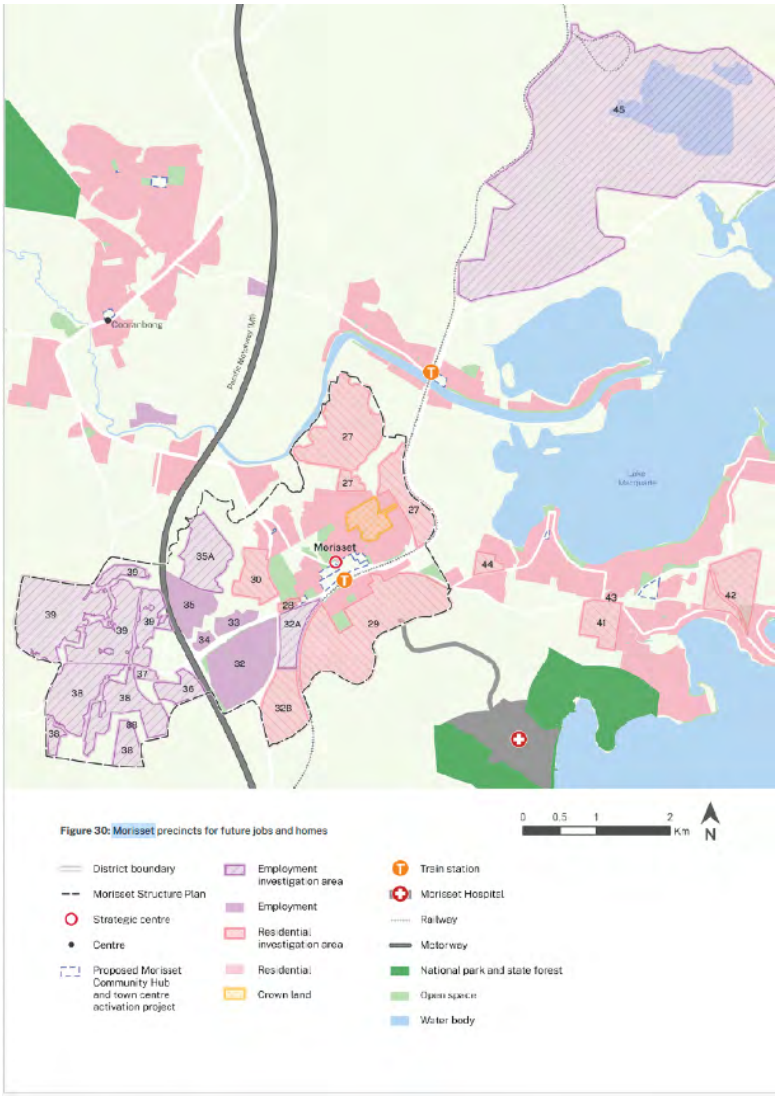


Figure 2: Morisset precincts for future jobs and people (source: Hunter Regional Plan 2041)

The Place Strategy will be designed to coordinate strategic planning and infrastructure decisions to guide future growth and enable area-wide planning proposals. Placemaking has varied definitions but a simple definition is provided as "the process of creating quality places that people want to live, work, play and learn in" (Public Square, CNU 2014). One of the features of a place people want to live, work, play and learn in is safety. Creating places which are safe and connected enables future communities to be more resilient.

The Morisset Place Strategy will guide the next twenty years of development and infrastructure provision to 2041 The Objectives of the Morisset Place Strategy are to:

- Help realise a sustainable, twenty-year growth vision for Morisset.
- Guide coordinated and sustainable development including rezoning and development proposals.
- Establish a framework or actions for resolving biodiversity impacts.
- Clarify required provision of infrastructure and community facilities to meet growth scenarios, including upgrades to the State Road network.
- Provide greater certainty to the community, NSW Government agencies, service authorities and the development sector concerning envisaged growth areas and infrastructure requirements.

A Morisset Place Strategy Discussion Paper was published by Lake Macquarie City Council. The Discussion Paper describes four possible growth scenarios for Morisset:

1. Morisset as usual – growth limited by current existing land use planning controls.
2. Inner Core – increased density around central Morisset through changes to residential planning controls.
3. Gateway Morisset – urban intensification of Morisset Central and commercial, agricultural and industrial land uses adjacent to the M1 motorway.
4. Morisset City – the full realisation of development across Morisset in terms of maximising residential and employment lands.

The Planning Institute of Australia (PIA) has advocated for the reduction of hazard exposure and vulnerability in a changing climate. This includes identifying and managing risks and hazards, locating future development (and infrastructure) within acceptable levels of vulnerability, avoiding 'unacceptable' risk and enabling 'building back more resilient' (PIA, 2021).

The High Level Bushfire Study is required to identify bushfire risks in the landscape, identify constraints and opportunities for bushfire risk and bushfire mitigation and make recommendations regarding future development within the Morisset area.

1.3 Scope of High Level Bushfire Study

The High Level Bushfire Study is required to address the requirements of Chapter 4 of *Planning for Bush Fire Protection 2019* (PBP) with regard to addressing bushfire issues at the strategic stage of development, although strict adherence to Chapter 4 of PBP is not a requirement of the study.

The Study Area has been identified to include 12 sites which have potential for future land use change. Five unique growth precincts, also referred to as 'Morisset regionally significant growth areas', have been identified within the Discussion Paper for the Morisset Place Strategy which all have different opportunities and future potential and which form part of the investigation areas as identified in the Hunter Regional Plan 2041 (HRP2041). The 12 sites originally identified for assessment within this High Level Bushfire Study all fall within these five growth precincts.

The Discussion Paper also identifies an additional eight locally and regionally important growth areas outside of the five growth precincts, some of which have been included as additional investigation areas in this Study. In summary, the High Level Bushfire Study includes various sites that fall within the five unique growth precincts, as well as within the other locally and regionally important growth areas as identified in the Discussion Paper. See Figure 3, 4 and 5 below for the growth areas included in the Discussion Paper:

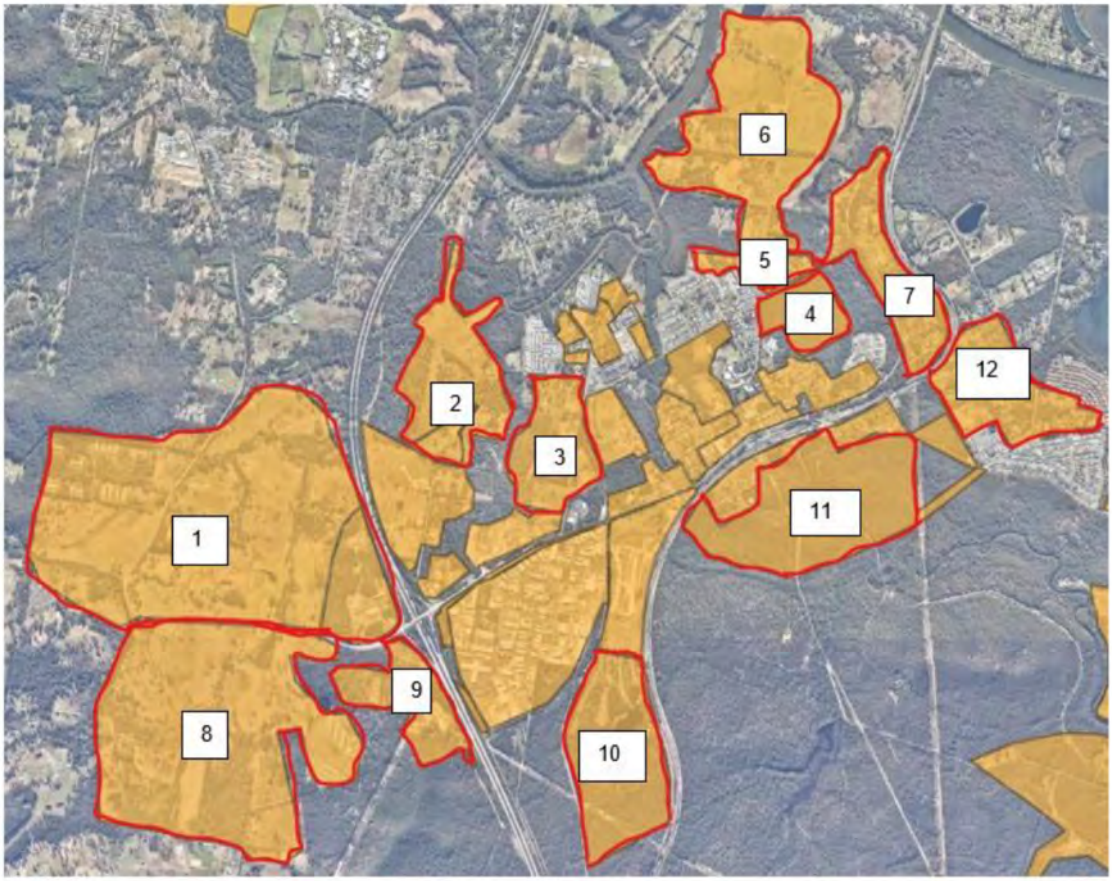


Figure 3: Study area with subject sites marked (source: Lake Macquarie City Council)

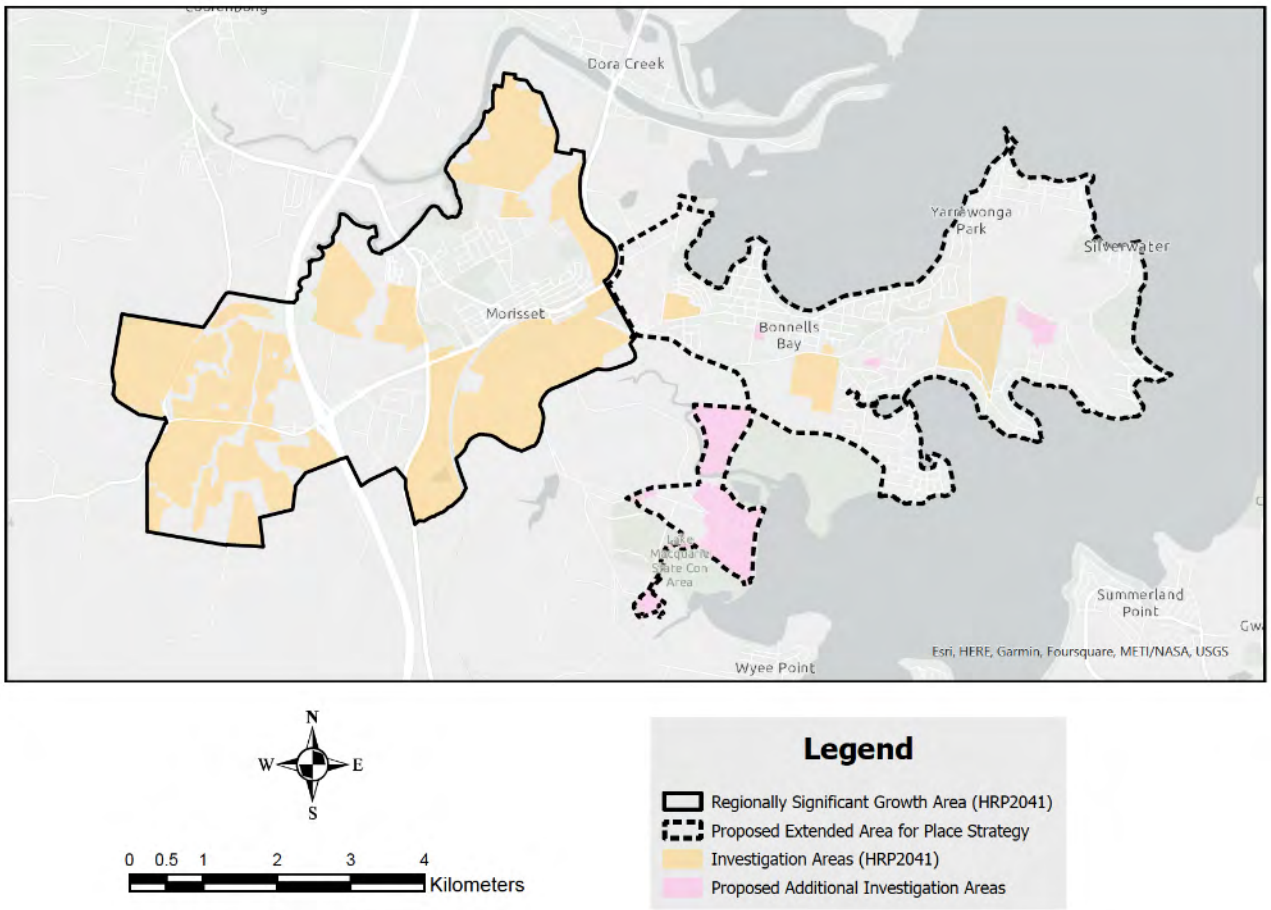


Figure 4: Investigation Areas (HRP2041) and Proposed Additional Investigation Areas

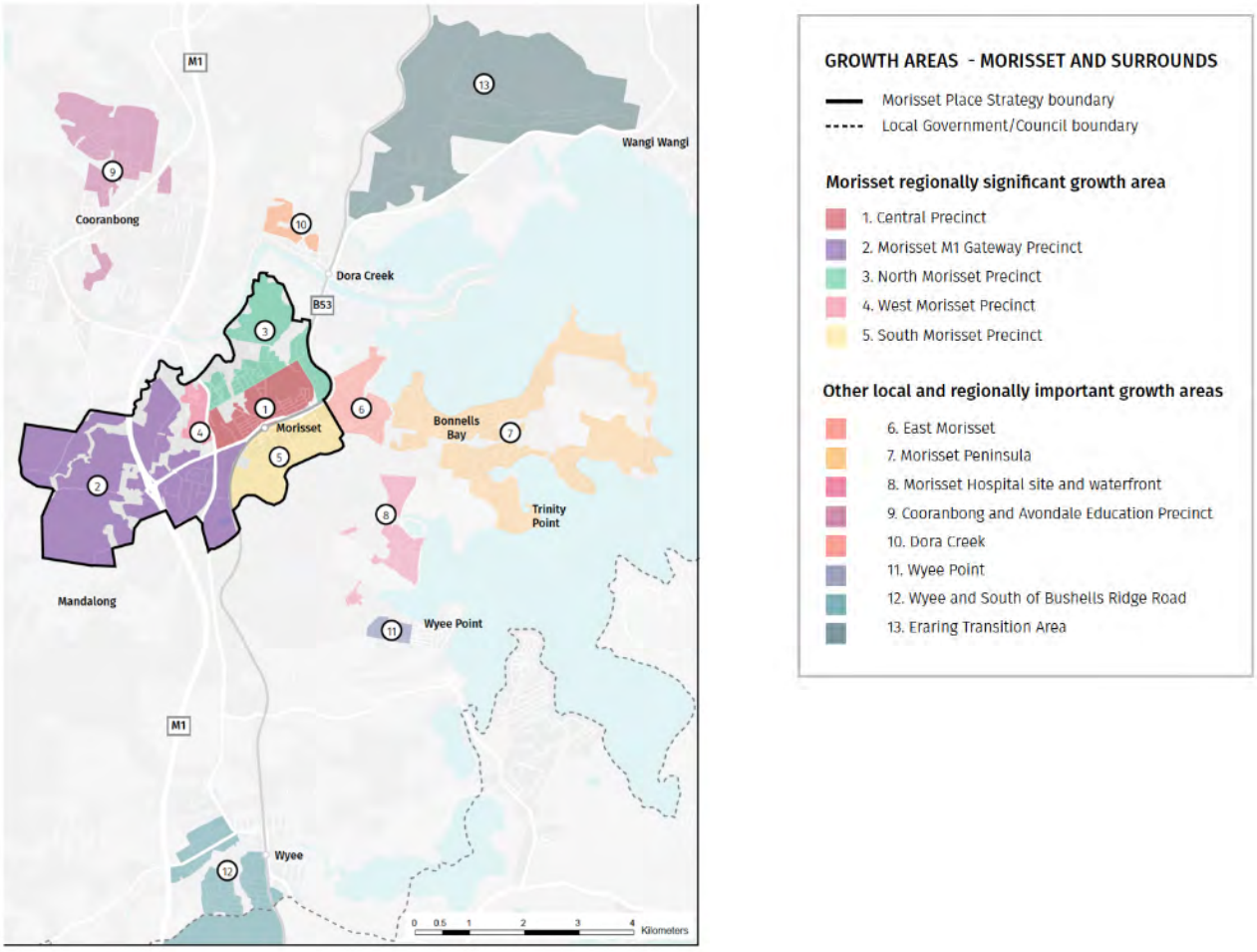


Figure 5: Five Precinct Areas and Eight Locally and Regionally Significant Growth Areas (source: Morisset Place Strategy Discussion Paper)

The study is required to examine the bushfire risk implications associated with potential future rezonings within the identified growth areas for new residential, commercial and industrial development with particular focus given to those areas located near and/or adjacent to bushfire prone vegetation. Based on this examination of bushfire risk, the study will recommend mitigation measures that may be required to reduce the risk and allow for new development to occur. The study will also identify areas where the bushfire risk is considered to be too high for new development to be considered appropriate.

Table 1 below shows the intended future development of each of the 12 subject sites included within the High Level Bushfire Study (shown in Figure 3).

Table 1: Future land uses

Site number	Future Land Use
1	Industrial/Agricultural/Conservation investigation area
2	Employment investigation area
3	Residential investigation area
4	Potential future rezoning of part of this area to an environmental conservation zoning
5	Residential investigation area
6	Residential investigation area

7	Residential investigation area
8	Employment investigation area
9	Employment investigation area
10	Residential investigation area
11	Residential investigation area
12	Residential investigation area
Morisset Peninsula	Fishery Point Road sub-precinct – Recreation or Conservation Lakeside Adventist Church – Future land use investigation Bay Vista Road sub-precinct - Environmental and future land use investigation Hannell Street sub-precinct - Intensification/development Mirrabooka Quarry sub-precinct – Future land use investigation
Morisset Hospital Site and Waterfront	Recreation and future land use investigation

Recommendations for future development may include any more detailed bushfire related studies or work that may need to be completed as part of future rezonings.

This study will consider any relevant international, national, State-wide and local guidance in reaching conclusions and making recommendations to improve the resilience of the land release and future community with regard to bushfire risks.

1.4 Global, National and State Policy Context

This High Level Bushfire Study aims to apply the guidance available to achieve, as far as possible, State, national and global policy objectives.

On a global scale, the Sendai Framework is designed to provide Member States such as Australia with actions to protection development from disaster risk (United Nations Office for Disaster Risk Reduction). The Framework has targets which include to substantially reducing global disaster mortality, to substantially reduce the number of affected people globally, to substantially reduce disaster damage to critical infrastructure and disruption of basic services and to reduce direct disaster economic loss. The Priorities for Action are:

- Priority 1 Understanding disaster risk
- Priority 2 Strengthening disaster risk governance to manage disaster risk
- Priority 3 Investing in disaster risk reduction for resilience
- Priority 4 Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

The Framework calls for decision-making to be risk-informed and to prevent the creation of disaster risk, whilst reducing existing disaster risk.

Australia's National Strategy for Disaster Resilience defines a resilient community as being one which: functions well whilst under stress, is underpinned by successful adaptation, is self-reliant and has social capacity. Land use planning has a key role to play in reducing built environment risks by creating approaches to community design that anticipate both likely risk factors and the potential vulnerability of the population. The strategic planning system is highlighted as having particular importance in contributing to the creation of safer and more sustainable communities (National Disaster Resilience Strategy, 2011). Key considerations set out within the National Disaster Resilience Strategy are:

- Risk to loss of life;
- Social, economic and infrastructure loss;
- Agreement on risk management principles;
- Approach to planning and development controls that will adequately mitigate identified risks;
- Agreed methodology or guidance on competing objectives, such as biodiversity conservation.

Building infrastructure to a more resilient standard will both reduce the need for recovery expenditure and reduce the risk of repeated damage to infrastructure. The diversity, needs, strengths and vulnerabilities of communities are key considerations within preparedness activities.

In terms of land use planning, the Australian Institute for Disaster Resilience (AIDR) Land Use Planning for Disaster Resilient Communities is the most relevant piece of national guidance available in the approach to strategic planning for natural hazards. The AIDR Handbook collection also includes the National Emergency Risk Assessment Guidelines (Handbook 10) and the Evacuation Planning Handbook (Handbook 4) which provide relevant context for this assessment and are referred to later in this report.

The development of a Place Strategy involves developing and maintaining the built environment and infrastructure to prevent, withstand and recover from climate change impacts, whilst continuing to perform its function and serve the community (NSW Climate Change Adaptation Strategy, 2022). The NSW Government issued the NSW Climate Change Adaptation Strategy in June 2022 which provides guidance regarding the intended approach to Climate Change at a State level. The guidance notes that the NSW climate has already changed, with NSW warming faster than the global average. Small temperature changes have contributed to more extreme weather events, including significant impacts from bushfire.

The NSW Rural Fire Service (NSW RFS) and NSW Department of Planning, Housing and Infrastructure (DPHI) are working collaboratively to publish a NSW Strategic Bushfire Policy in response to Recommendation 27 of the 2020 NSW Bushfire Inquiry and it is anticipated that this will include guidance on climate change. To date, there have been no publications and there is no guidance with regard to the inclusion of climate change within Strategic Bushfire Studies. Nevertheless, the recommendations of the 2020 NSW Bushfire Inquiry following the Black Summer fires clearly point to the importance of incorporating climate change into the planning of future communities. This study therefore includes climate change within the risk assessment and resultant recommendations.

1.5 Legislative and Compliance Context

The inclusion of Morisset as a Regionally Significant Growth Area within the *Hunter Regional Plan 2041* sets certain development expectations for the area. However, individual sites will be subject to rezoning and more detailed studies prior to any development expectation being realised.

Future development on any land mapped as Bush Fire Prone, or any land which displays properties which may lead to bushfire risk, must display compliance with *Planning for Bush Fire Protection 2019* (or any version of *Planning for Bush Fire Protection* or other relevant publication in place at the time of the proposal). Planning Proposals to rezone on land mapped as being Bush Fire Prone will be required to comply with Local Ministerial Direction 4.3 *Planning for Bushfire Protection* and must have regard to *Planning for Bush Fire Protection 2019*.

At this level, any future challenges in complying with the requirements of PBP can be identified and appropriate planning strategies developed to overcome as many challenges as possible prior to rezoning occurring.

2 Methodology

The High Level Bushfire Study (SBS) has been prepared having regard to the guidance within PBP 2019 and specifically Table 4.2.1 which provides heads of consideration for Strategic Bushfire Studies:

1. Bush fire landscape assessment – the SBS undertakes the risk assessment over a 5km radius. This distance is considered wide enough to understand potential fire behaviour in the landscape that may impact the subject site.
2. Land use assessment – the land use assessment is based on Figures 4 and 5 provided by Lake Macquarie City Council.
3. Access and egress – the study uses the guidance within AIDR Evacuation Planning Handbook (10) and the principles within Cova to establish recommendations for access.
4. Emergency services – information from Lake Macquarie City Council has been used to assess emergency services capacity and need for any new facilities.
5. Infrastructure – observations from site inspections and information provided by Lake Macquarie City Council are used, along with the experiences of Black Summer to determine infrastructure requirements.
6. Adjoining land – the impact of the proposed development on adjoining land is assessed using the Bush Fire Risk Management Plan framework.

As this study considers multiple sites within one study, a table will be prepared providing a summary of the risk and mitigation at each of the sites. This table provides an easy reference snapshot of the high level bushfire study, the detail for which is included within the report itself.

2.1 Risk Assessment

The National Emergency Risk Assessment Guidelines (NERAG) (Handbook 10) provide a risk assessment framework which is designed for on the ground emergency management planning during operational hazard management, but is also relevant to Land Use Planning:

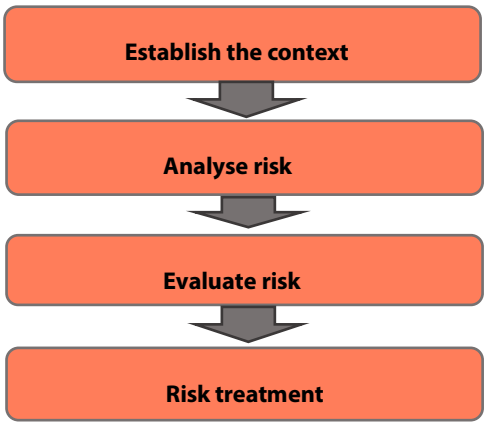


Figure 6: NERAG Risk Assessment Framework (Australian Institute for Disaster Resilience)

This framework will be used within this study to apply treatment measures which are directly relevant to the evaluated risk at each of the sites with the intention of reducing the risk profile of future development and creating a more resilient future community.

Risk can be categorised using a Risk Matrix published within the National Emergency Risk Assessment Guidelines (NERAG) produced by the Australian Institute of Disaster Resilience (AIDR) 2020 (Figure 8). This is a tool generally used in Bush Fire Risk Management Planning to assign risk treatments to existing communities in order to reduce risk. It is a useful marker for new development planning to understand the level risk reduction that can be achieved by assigning risk treatment to planned settlements.

LIKELIHOOD	CONSEQUENCE LEVEL				
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
ALMOST CERTAIN	Medium	Medium	High	Extreme	Extreme
LIKELY	Low	Medium	High	Extreme	Extreme
UNLIKELY	Low	Low	Medium	High	Extreme
RARE	Very low	Low	Medium	High	High
VERY RARE	Very low	Very low	Low	Medium	High
EXTREMELY RARE	Very low	Very low	Low	Medium	High

Figure 7: Risk Matrix (AIDR, 2020)

Although Recommendation 27 of the NSW Bushfire Inquiry (2020) has not officially been addressed by the NSW Government, its wording remains relevant to this study and will be considered within this study with particular regard to the need to provide guidance on the need to incorporate a climate change factor into assessments such as this.

> ***Recommendation 27***
> *That Government commit to shifting to a strategic approach to planning for bushfire, and develop a new NSW Bush Fire Policy similar to the NSW Flood Prone Land Policy in order to accommodate changing climate conditions and the increasing likelihood of catastrophic bush fire conditions; to build greater resilience into both existing and future communities; and to decrease costs associated with recovery and rebuilding.*

2.2 Risk Tolerance

Chapter 4 of PBP 2019 provides a solid basis from which to assess strategic bushfire risk and apply mitigation treatment. However, once risk has been assessed and treatments identified, the principle of determining how much residual risk is acceptable in new development presents a challenge. Applying 'acceptable' or 'tolerable' risk in this study will be carried out using the principle "As Low As Reasonably Practicable" (ALARP) as per the Australian Institute for Disaster Resilience Land Use Planning for Disaster Resilient Communities Handbook (see Figure 9).

Figure 8: ALARP Principle (PIA 2015)

It is impractical to expect that the bushfire risk level within the community can be reduced to zero, in order to protect native biodiversity and build new housing, we must accept that a baseline level of bushfire risk is inevitable. However, we do have the ability in planning settlements such as this to apply measures which can drive down the level of risk as low as possible. This study will utilise this principle, along with consideration of the ongoing Bush Fire Risk Management process, to determine the risk treatments which can be applied to enable the risk within both the existing and future communities to be "as low as reasonably practicable". An element of balance is required to achieve this.

3 Landscape Scale Bushfire Risk

The landscape scale bushfire risk is measured over a 5km radius measured from the Morisset train station, which is a central point within the Morisset urban area. The 5km radius and bushfire prone land mapping over the 5km radius are shown in Figures 10 and11 below.

Figure 9: 5km assessment radius

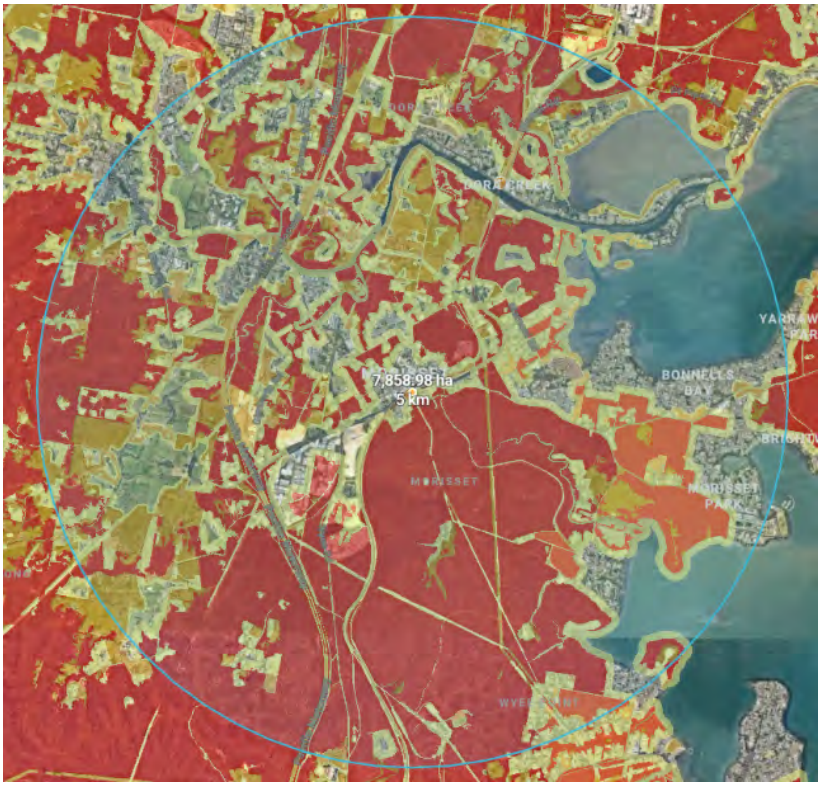


Figure 10: Bush Fire Prone Land Map over 5km assessment radius

Category 1 Bush Fire Prone Land Mapping represents the highest combustibility and is represented by the red areas on the map, it includes areas of forest, woodland, forested wetland and heath. Category 2 on the map represents the lowest combustibility and may include areas of remnant vegetation or areas of vegetation with some degree of management. It is represented by a dark yellow on the map. Category 3 represents medium combustibility and is coloured orange on the map, it generally includes areas of grassland. The lighter yellow areas on the map represent the buffer applied to the vegetation and generally captures properties which are considered to be 'bushfire prone' in that they require mitigation through new development.

Although the 5km radius is one I have typically used in other bushfire studies, and represents the risk leading into the study area, I have also in this instance included maps which show the wider risk within the landscape as I believe this is relevant to this study. Figures 12, 13 and 14 below show the wider landscape risk to the north, west and south. There are significant areas of Category 1 vegetation within the landscape around the Morisset settlement. This potentially represents an ability for fire to burn within the landscape under hot, dry northerly or north westerly winds, building up a significant amount of intensity prior to impacting the Morisset area. This serves as background context to the calculated risk at each of the sites in the ensuing sections of the report below.

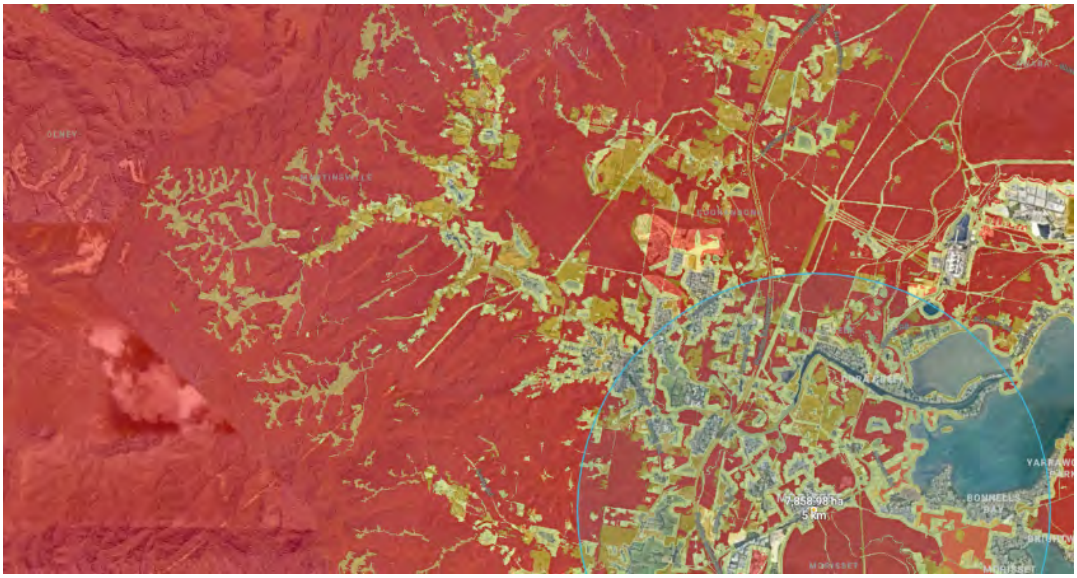


Figure 11: Wider bushfire landscape risk to north

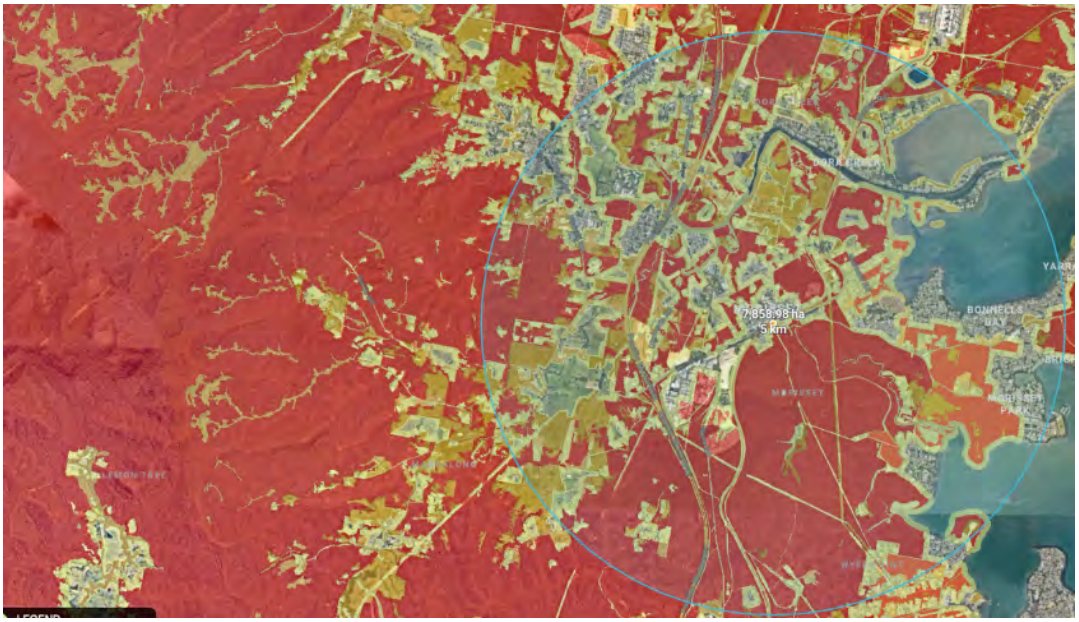


Figure 12: Wider landscape bushfire risk to west

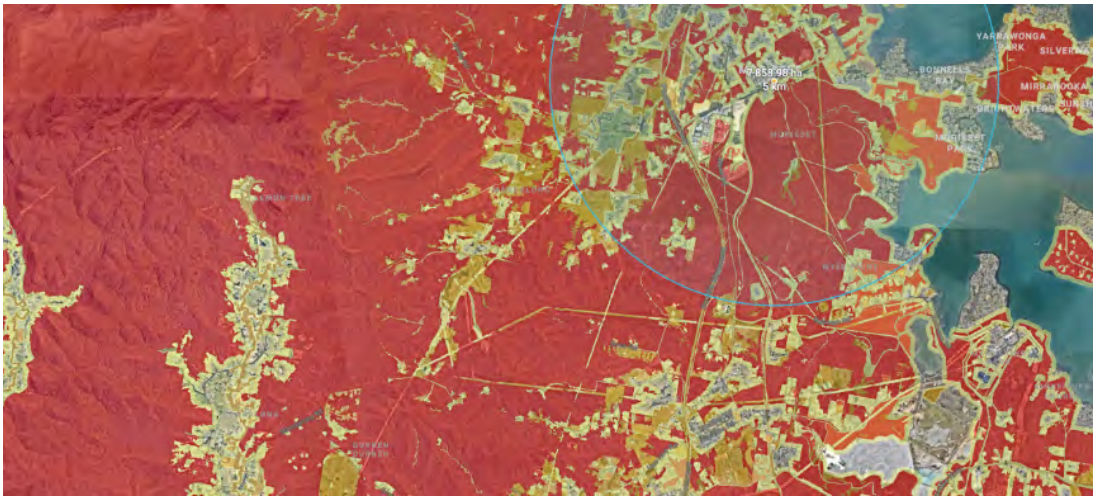


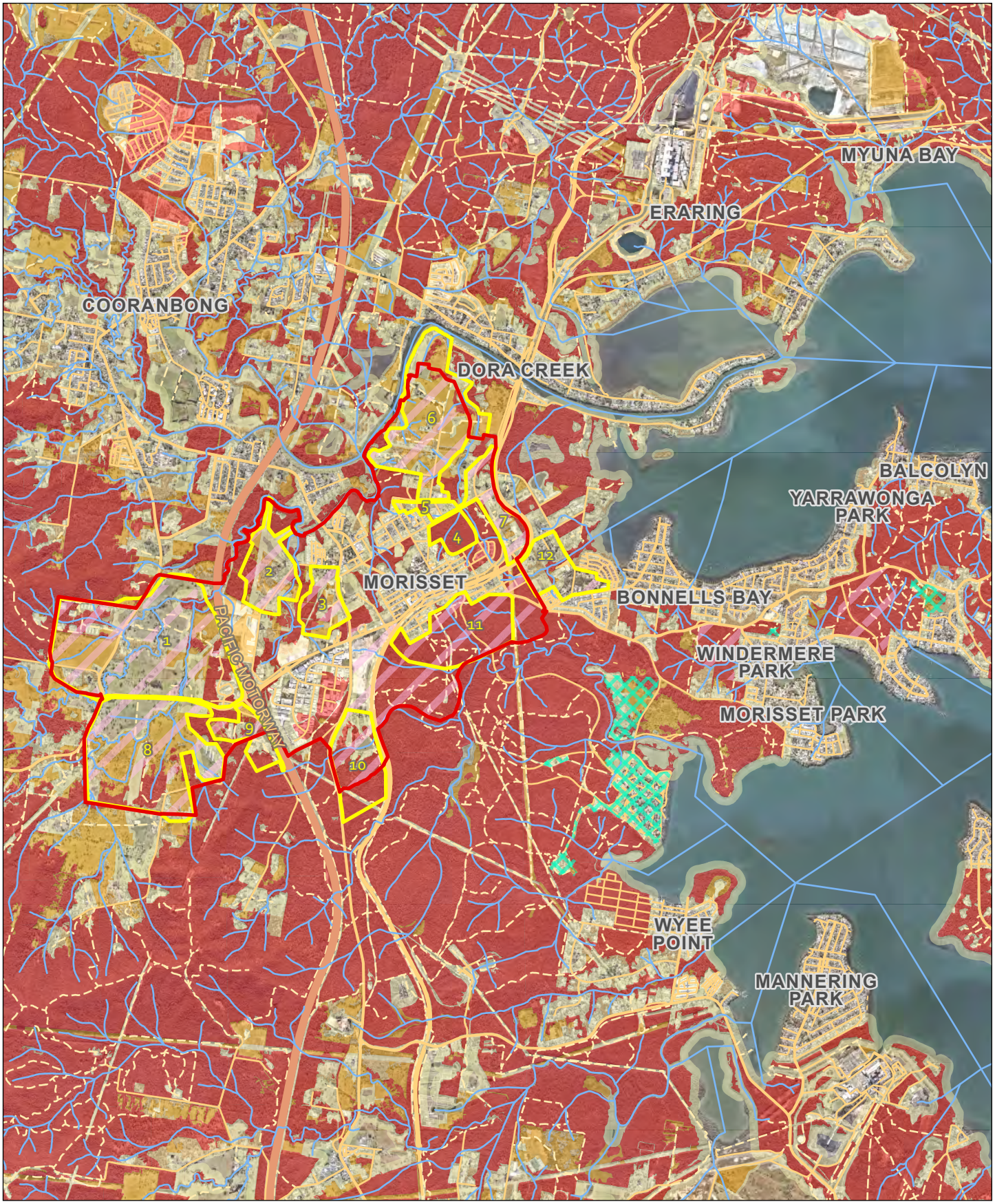
Figure 13: Wider landscape bushfire risk to south

Within the following sections of Chapter 3, a general description of the features of bushfire risk in the study area is provided, with descriptions provided for each of the individual sites within a table.

3.1 Bush Fire Prone Land Mapping

Land mapped as being bushfire prone is more limited within the study area than the wider landscape. Primarily this is due to the study area being occupied by the existing urban area of Morisset. Land within the study area is partially mapped as either Category 1 or Category 3, representing areas of high and medium combustibility. As more land is developed within the study area, less land will be mapped as being bushfire prone and will be subject to the requirements of *Planning for Bush Fire Protection*.

There is more land mapped as bushfire prone Category 1, representing high combustibility, in and around the Investigation Areas and Proposed Additional Investigation Areas. At a high level, this shows a high level of bushfire risk in and around these sites which requires further investigation.



Legend

- Watercourse
- Motorway
- Major Road
- Minor Road
- Track-Vehicular
- Path

Bushfire Prone Land

- Vegetation Category 1
- Vegetation Cateogry 2
- Vegetation Category 3
- Vegetation Buffer
- Investigation Areas
- Additional Investigation Areas
- Study Area
- Regionally Significant Growth Area

N

DKGIS

Date: 31/10/2023

0 250 500 1,000

Meters

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 15: Bushfire Prone Land

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3.2 Vegetation

Vegetation within the study area has been assessed using State Vegetation Type Mapping and Greater Hunter vegetation mapping, both of which yield similar results. Both vegetation maps are provided for the individual sites within the study area in Figures 16 and 1.

The area of Category 1 vegetation situated northwest of the study area is predominantly Northern Hinterland Wet Sclerophyll Forest, interspersed with small pockets of Hunter-Macleay Dry Sclerophyll Forest. The vegetation transitions to become more predominantly Dry Sclerophyll Forest as it moves to the southwest of the study area, transitioning to Sydney Coastal Dry Sclerophyll Forest mixed with Forested Wetland to the south of the study area. The vegetation to the north of the study area is also predominantly dry sclerophyll forest mixed with areas of forested wetland, with a background of wet sclerophyll forest further north.

Both wet and dry sclerophyll forest carry high fuel loadings, with wet sclerophyll forest carrying the highest fuel loadings. Forested wetland also carries high fuel loadings. Having wet and dry sclerophyll forest mixed with forested wetland in the northern and northwestern aspect represents a significant bushfire risk potentially impacting the study area. The hottest and driest winds come from the north/northwest/west of the state and can result in the most intense fire behaviour, fuelled by strong winds. Having high fuel loads in this aspect of the study area creates the highest bushfire risk.

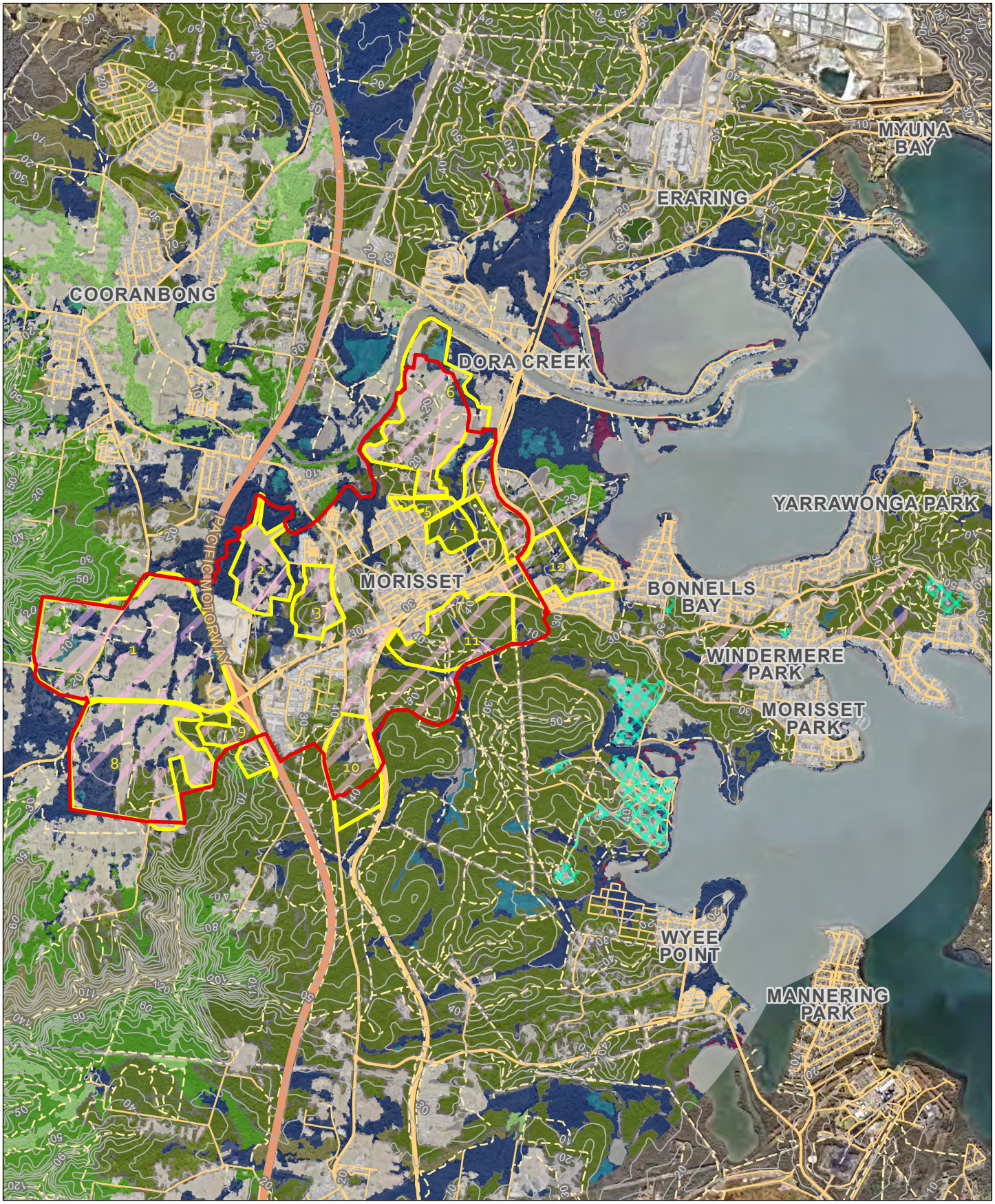
Fires from the south can be equally destructive. Although winds from the south tend to be cooler, there is potential for fires originating in the northwest to be subject to a southerly wind change, pushing an already intense fire front towards the study area from the south. Wind changes such as this have historically been challenging for fire agencies to suppress and have led to destructive outcomes. The dry sclerophyll forest mixed with forested wetland to the south of the study area also represents a very high bushfire risk. The overall bushfire prone landscape is extremely high risk.

The landscape vegetation for each of the individual sites is discussed in Table 2 below.

Table 2: Vegetation analysis for individual sites

Site number	Vegetation Analysis
1	Wet Sclerophyll Forest (WSF) to the northwest, forested wetland and grassland within the site. WSF is connected to a large expanse of WSF vegetation situated within the landscape to the northwest. Significant fire danger from the northwestern aspect. Forested wetland generally follows riparian corridors, with a larger pocket in the northeast of the site. There is a small pocket of dry sclerophyll forest (DSF) in the southeast corner of the site.
2	Forested wetland to the north and west of the site, some forested wetland continuing into the centre of the site. The remainder of the site is grassland. DSF mixed with forested wetland to southeast, partially within site 3.
3	Vegetation within the site consists of DSF and small areas of forested wetland. Off site there is a small area of DSF to the southeast and a mixed community of DSF and forested wetland to the west/southwest.
4	The entire site is populated with DSF, with a tract of forested wetland within the site. There is DSF and forested wetland adjacent to the site to the east and south. There are also areas of DSF to the northwest within site 5.
5	The bushfire risk within site 5 is from DSF. Outside the site, there is a tract of forested wetland to the east and within site 4 to the south, along with a large amount of DSF within site 4. There is also DSF off site to the northwest.

6	Site 6 is largely occupied by grassland, with some DSF within the southern portion of the site and beyond the site boundary to the south. There is also forested wetland surrounding site 6, along with freshwater wetland to north and a small amount to the south east. The vegetation on the western side of Dora Creek is a mixture of freshwater and forested wetland.
7	There are small areas of DSF and forested wetland within the site and a larger area of DSF and forested wetland to the west of the subject site and within site 4 to the west. There is also a patch of forested wetland in the northern portion of the site and beyond the site boundary. There are patches of DSF to the east of the subject site beyond Main Road. Much of the site is already developed for commercial uses and is therefore subject to some management.
8	The site is occupied by forested wetlands in the southwestern corner, which extends off site to the west. The south and east of the site is occupied by DSF, with a large area of DSF off site to the southeast. The remainder of the site is occupied by grassland with forested wetland along riparian corridors.
9	The vegetation within and surrounding site 9 is DSF. There is a large expanse of DSF to the south of site 9.
10	Site 10 is subject to an existing development application and has already been largely cleared for development. Large expanses of DSF remain to the south, east and west of the site.
11	Site 11 is entirely occupied by DSF and small areas of forested wetland. There is a large expanse of DSF to the south of site 11, mixed with patches of forested wetland and freshwater wetland along water courses.
12	Site 12 is occupied by large residential properties, with remnant pockets of DSF and forested wetland mixed with grassland. Adjacent to site 12 is a vacant lot entirely occupied by DSF and forested wetland.
Morisset Peninsula	The landscape within the peninsula area which is not covered by urban development is predominantly DSF.
Morisset Hospital Site and Waterfront	The Morisset Hospital site is surrounded by DSF, part of which is associated with The Lake Macquarie State Conservation Area and is a significant and protected area of DSF.



Legend

- Contour - 10m
- Motorway
- Major Road
- Minor Road
- Track-Vehicular
- Path
- Investigation Areas
- Additional Investigation Areas
- Study Area
- Regionally Significant Growth Area

Vegetation Formation - State Vegetation Type Mapping 2022

- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Dry Sclerophyll Forests (Shrubby sub-formation)
- Forested Wetlands
- Freshwater Wetlands
- Not native vegetation
- Rainforests
- Saline Wetlands
- Unattributed
- Wet Sclerophyll Forests (Grassy sub-formation)
- Wet Sclerophyll Forests (Shrubby sub-formation)

N

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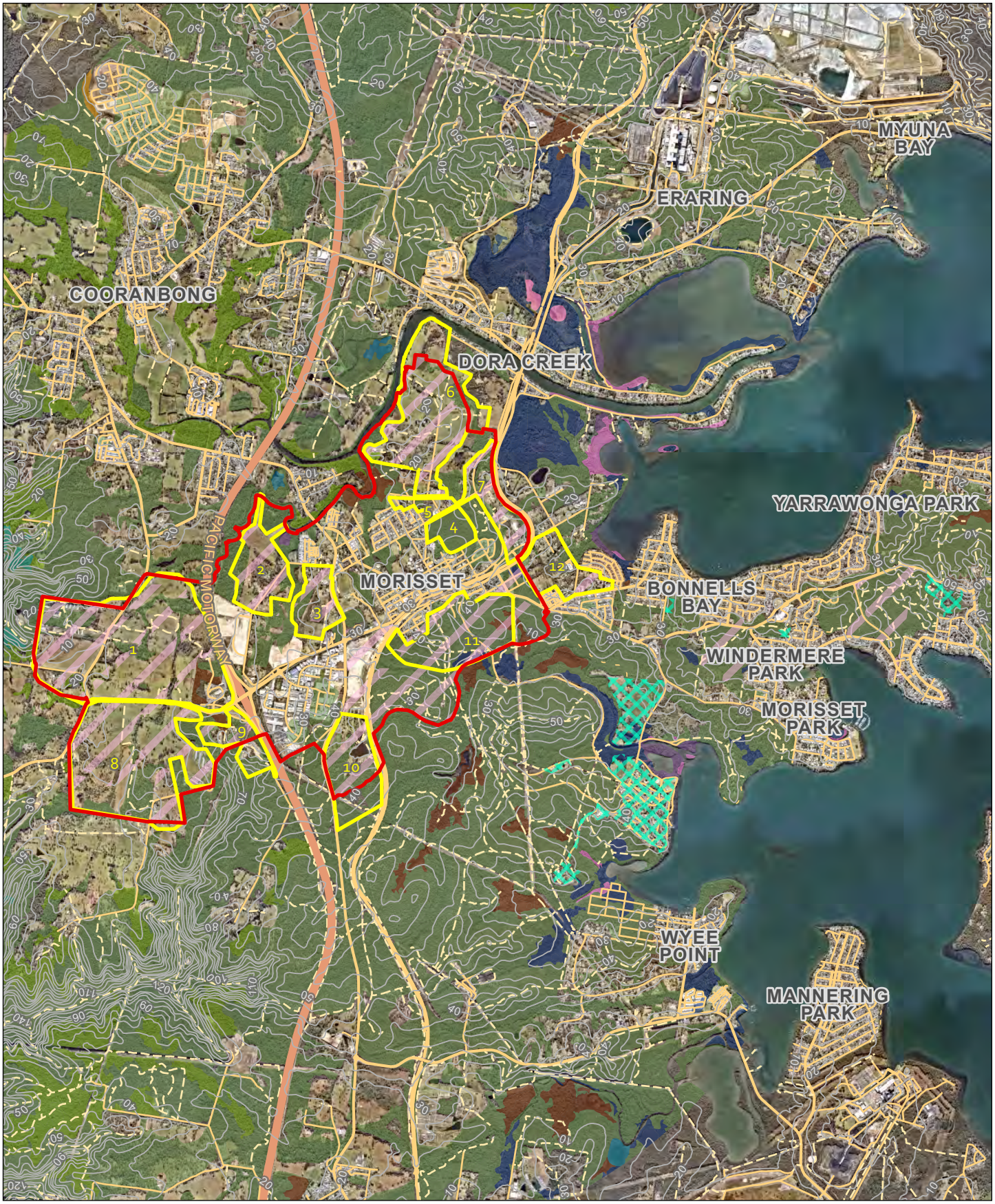
Meters

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 16: Vegetation Keith Formation - State Vegetation Type Mapping

CR Bushfire.



Legend

- Contour - 10m
- Motorway
- Major Road
- Minor Road
- Track-Vehicular
- Path
- Investigation Areas
- Additional Investigation Areas
- Study Area
- Regionally Significant Growth Area

Keith Formation - Greater Hunter

- Unknown
- Dry sclerophyll forests
- Forested wetlands
- Freshwater wetlands
- Mangrove Swamps
- Rainforests
- Saltmarshes
- Shrublands
- Wet sclerophyll forests

N

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Date: 31/10/2023

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Meters

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 17: Vegetation Keith Formation - Greater Hunter

CR Bushfire.

3.3 Topographical features

The topography within the landscape is undulating, demonstrating some steep slopes within the 5km assessment radius. Fire travels faster uphill and there is plenty of opportunity within this landscape for fire to pick up speed, momentum and intensity when travelling upslope. The topography, along with the vegetation, within the landscape lends itself to fires being able to build in speed and intensity.

The slopes within the WSF to the northwest are steep and follow a riparian corridor. Similarly, slopes within the DSF to the southwest are also steep, following a riparian corridor. Both of these topographical features accentuate the fire risk from the northwest and southwest. Elsewhere in the study area, slopes are not as steep, but there is variation in the landscape which encourages fire to travel. Further detail regarding the way topography impacts the bushfire risk at the individual sites is provided in Table 3 below.

The 5km topographical assessment is shown in Figure 18 below.

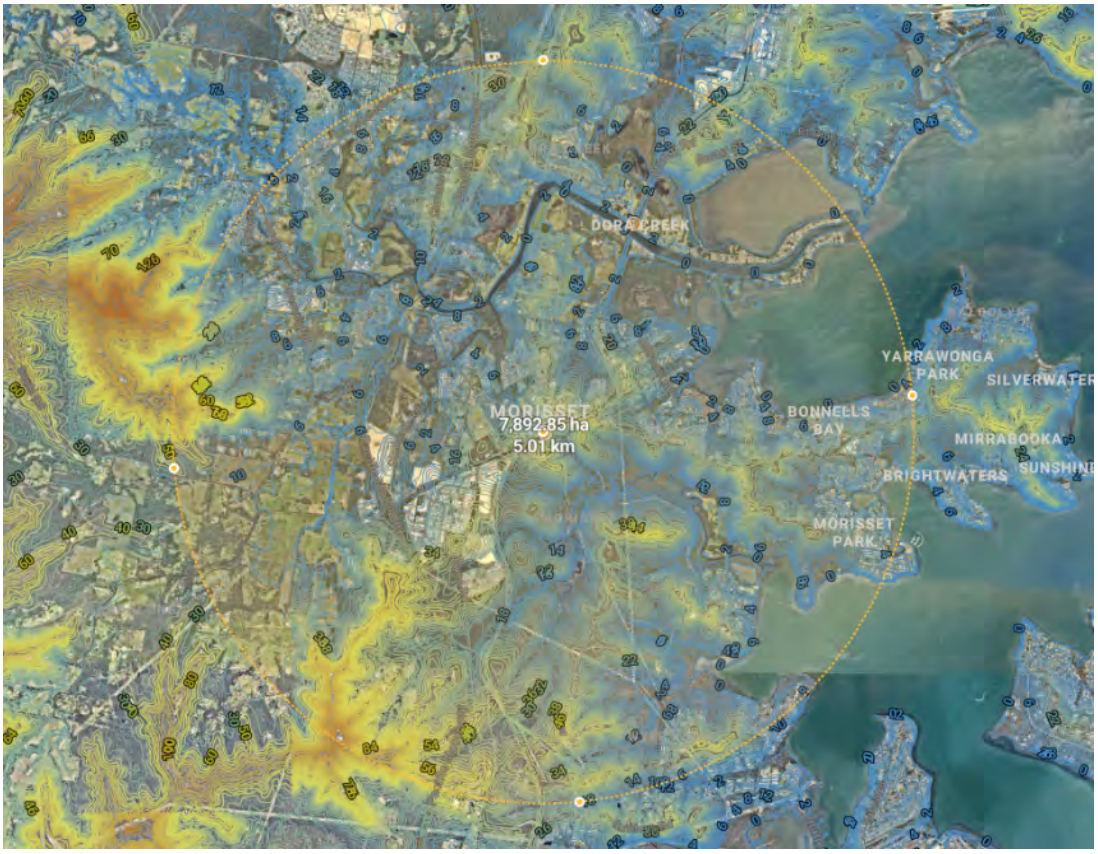


Figure 18: 5km topographical assessment

Table 3: Topographical analysis over 5km assessment area

Site number	Slope Analysis
1	The site is relatively flat and low lying, but the slope under the WSF vegetation to the northwest is steep, allowing fire to travel quickly and build in intensity.
2	The site and surrounding area is relatively flat and low lying.
3	The site and surrounding area is relatively flat and low lying.
4	The site is subject to a shallow cross slope (approximately 3 degrees), allowing fire to travel upslope from west to east.
5	The site is subject to a shallow downslope to the north east.

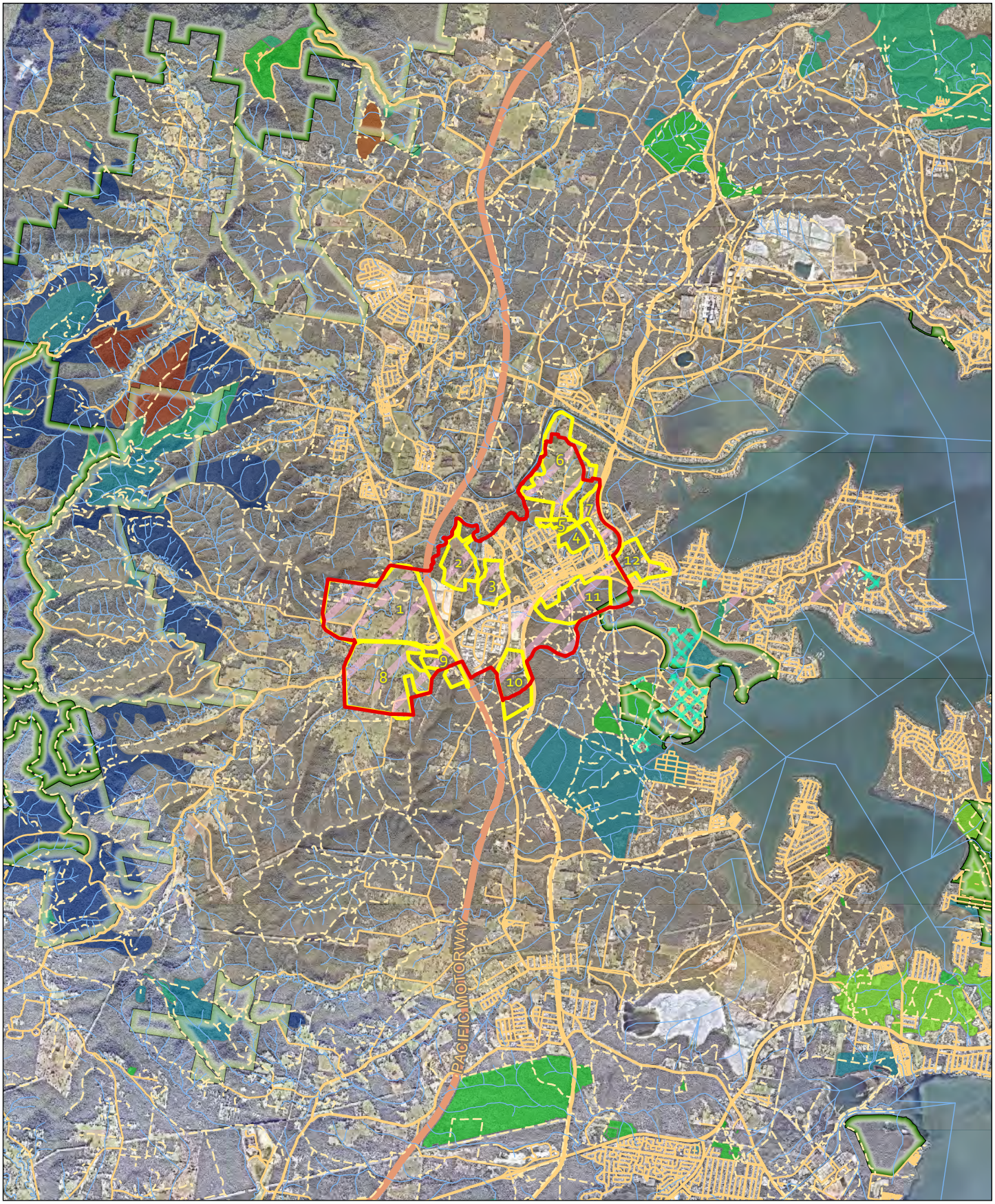
6	The land undulates, reaching a peak within the centre of the site.
7	The site is sloping from west to east and also slopes down in the northern corner of the site.
8	The site itself is relatively flat and low lying, but there are steeper slopes within the WSF to the northwest and DSF to the south that will influence fire behaviour.
9	The site itself is relatively flat and low lying, but there are steeper slopes within the DSF to the south.
10	The site is relatively flat and low lying, with an upslope to the south and downslopes with relatively undulating land under the vegetation to the east.
11	The vegetation is on a downslope of approximately 6-7 degrees (varying over the vegetation). This can enable fire to travel upslope towards any development on the site.
12	The site is relatively flat and low lying.
Morisset Peninsula	Slopes within the peninsula area are generally undulating, with some small pockets around ridgetops which become steeper. The slopes generally have the ability to allow fire to move and build in intensity but the slopes in this area generally are not steep. There are some fairly steep slopes at the eastern end of the peninsula in the Mirrabooka area where one of the Proposed Additional Investigation Areas is situated which would enable more intense fire activity.
Morisset Hospital Site and Waterfront	The slopes to the west of the Morisset Hospital site are a little steeper than the surrounding land which may enable fire to build in intensity on the site boundary.

3.4 Fire history

There is some wildfire history within the landscape surrounding the study area, shown within Figure 19. The closest fire history is to the south of the subject site, and potentially impacting the additional areas included within the study. Fires in this area burnt between 1990-2000 and 2010-2015, the specific dates are not available within public records. Areas further south of this were also impacted 2006-2010 and 2010-2015.

Land to the west/northwest/southwest of the study area has been subject to previous fire. The WSF to the northwest and DSF to the southwest were both impacted by fire pre-1990. The WSF to the northwest was subject to fire during the 2019-2020 Black Summer fires and a small area impacted between 1990 and 2000 and between 2000 and 2005.

The incidence of previous fire within the landscape is an indicator that, in the right climatic conditions, fire could impact again. Large areas of the WSF and DSF surrounding the site to the west were impacted quite some time ago, between 24 and 34 years ago and have not been impacted since. Based on fire intervals, it is likely that this vegetation has now regrown to its fullest extent. The areas impacted within the Black Summer fires will be subject to a lesser regrowth extent but still have the potential, five years later, to burn again.



Legend

- Watercourse
- Motorway
- Major Road
- Minor Road
- Track-Vehicular
- Path
- Investigation Areas
- Additional Investigation Areas
- Study Area
- Regionally Significant Growth Area
- National Park
- State Forest

Wildfire History

- Pre 1990
- 1990-2000
- 2000-2005
- 2006-2010
- 2010-2015
- 2016-2017
- 2018-2019
- 2019-2020

N

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Date: 31/10/2023

0 1 2 4

Kilometers

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 19: Wildfire History

CR Bushfire.

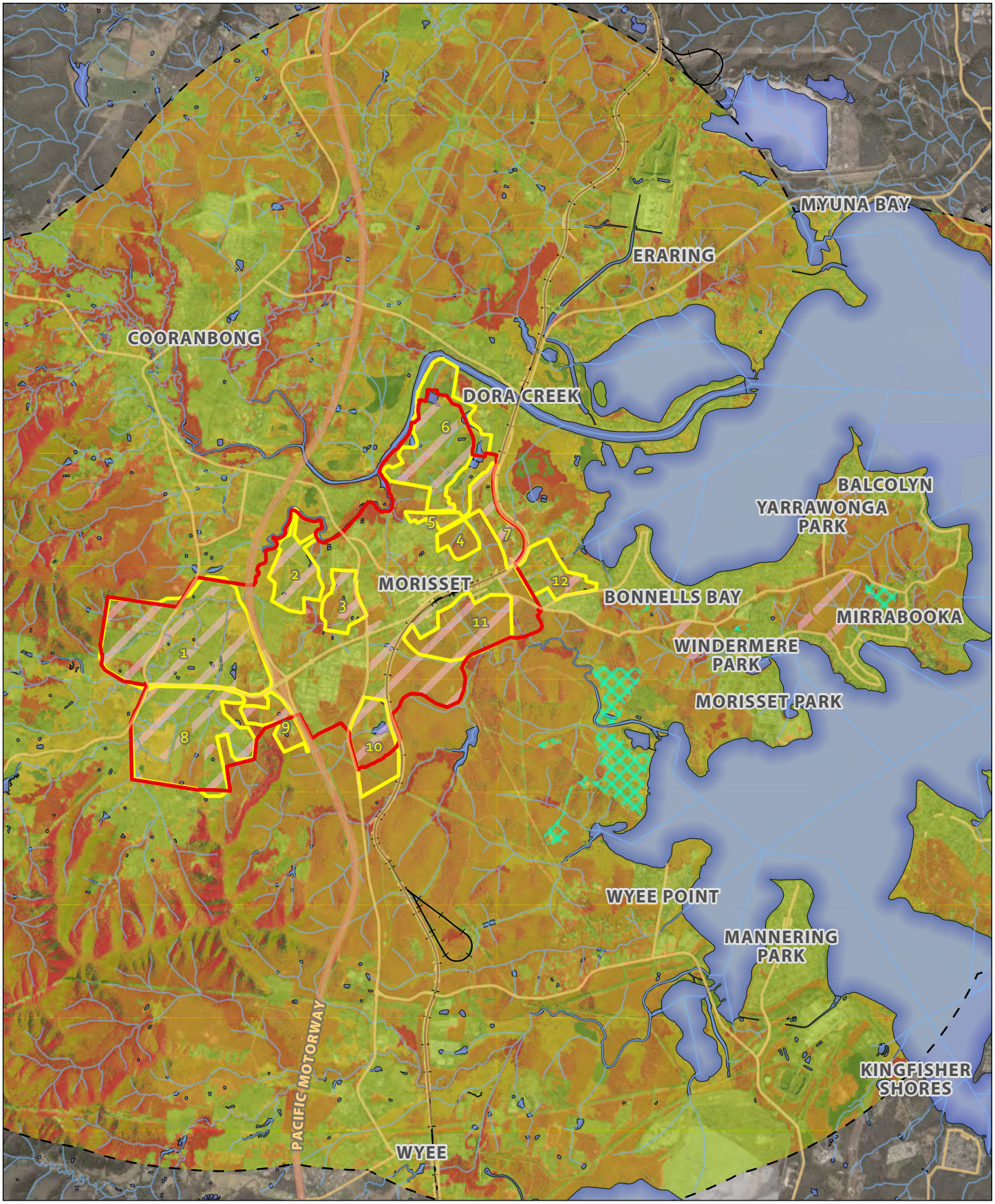
3.5 Fireline intensity

Fireline intensity is shown in Figures 20, 21 and 22. Each figure depicts the potential intensity of fire in different climatic conditions. Figure 20 shows the fireline intensity from a north to southwest wind direction, Figure 21 shows the fireline intensity from a southeast to southwest wind direction and Figure 22 shows the fireline intensity from a north to southeast wind direction. The greatest fireline intensity, and therefore worst-case scenario, is the north to southeast wind direction.

All three figures show that the potential fireline intensity is greatest in the WSF to the northwest and DSF to the southeast. In the north to southeast wind scenario, the fireline intensity is very high in places on the boundary of site 1 and in close proximity to site 8. The fireline intensity is lower to the south of sites 10 and 11 within the study area, but there is still potential for significant fire activity including smaller patches of very high fireline intensity within the landscape.

The fireline intensity around the peninsula area has the ability to result in more intense fire activity, around the Mirrabooka area and Morisset Park. There is moderate fireline intensity around the Morisset Hospital site, with small pockets of higher fireline intensity possible adjacent to the hospital site. Fireline intensity within the Hospital site itself is much lower, likely due to the lower lying areas of the site with limited slope ranges.

There is a small patch of very high fireline intensity between sites 2 and 3. Sites 4 and 5 contain moderate fireline intensity, with the potential for higher fireline intensity in patches. Site 11 has the greatest fireline intensity within the study area, with potential fire activity across the entire site and small patches of very high fireline intensity.



Legend

- Waterbody
- Regionally Significant Growth Area
- Study Area
- Additional Investigation Areas
- Investigation Areas
- Buffer - 5km

Fire Intensity (kW/m) N-SW

- <100
- 100 - 500
- 500 - 1,500
- 1,500 - 5,000
- 5,000 - 10,000
- 10,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- 75,000 - 100,000
- >100,000

N

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0 1 2 4

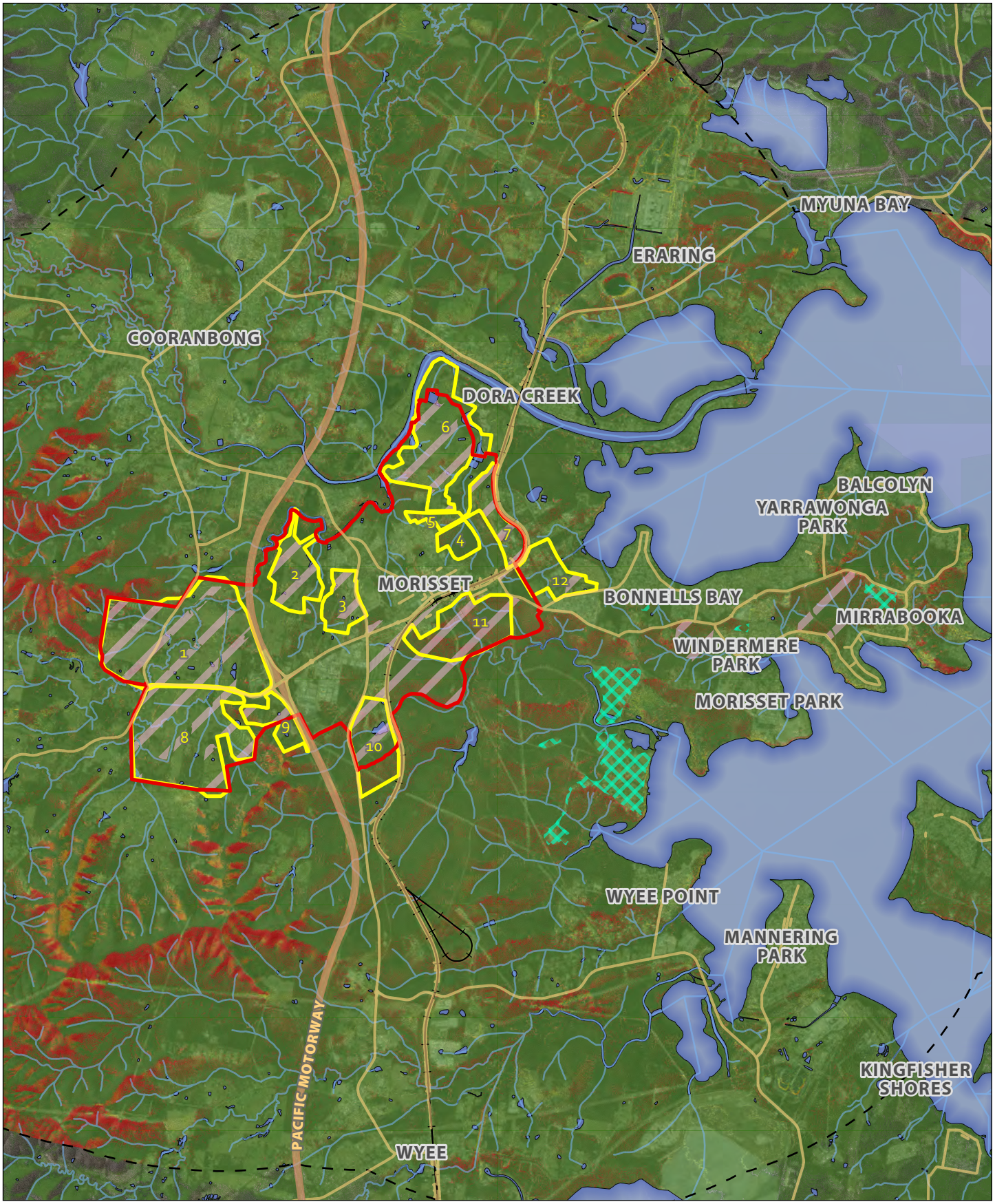
Kilometers

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 20: Fire Intensity (kW/m) North to South West

CR Bushfire.



Legend

- Waterbody
- Regionally Significant Growth Area
- Study Area
- Additional Investigation Areas
- Investigation Areas
- Buffer - 5km

Fire Intensity (kW/m) SE-SW

- <100
- 500 - 1,500
- 1,500 - 5,000
- 5,000 - 10,000
- 10,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- 75,000 - 100,000
- >100,000

N

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0 1 2 4

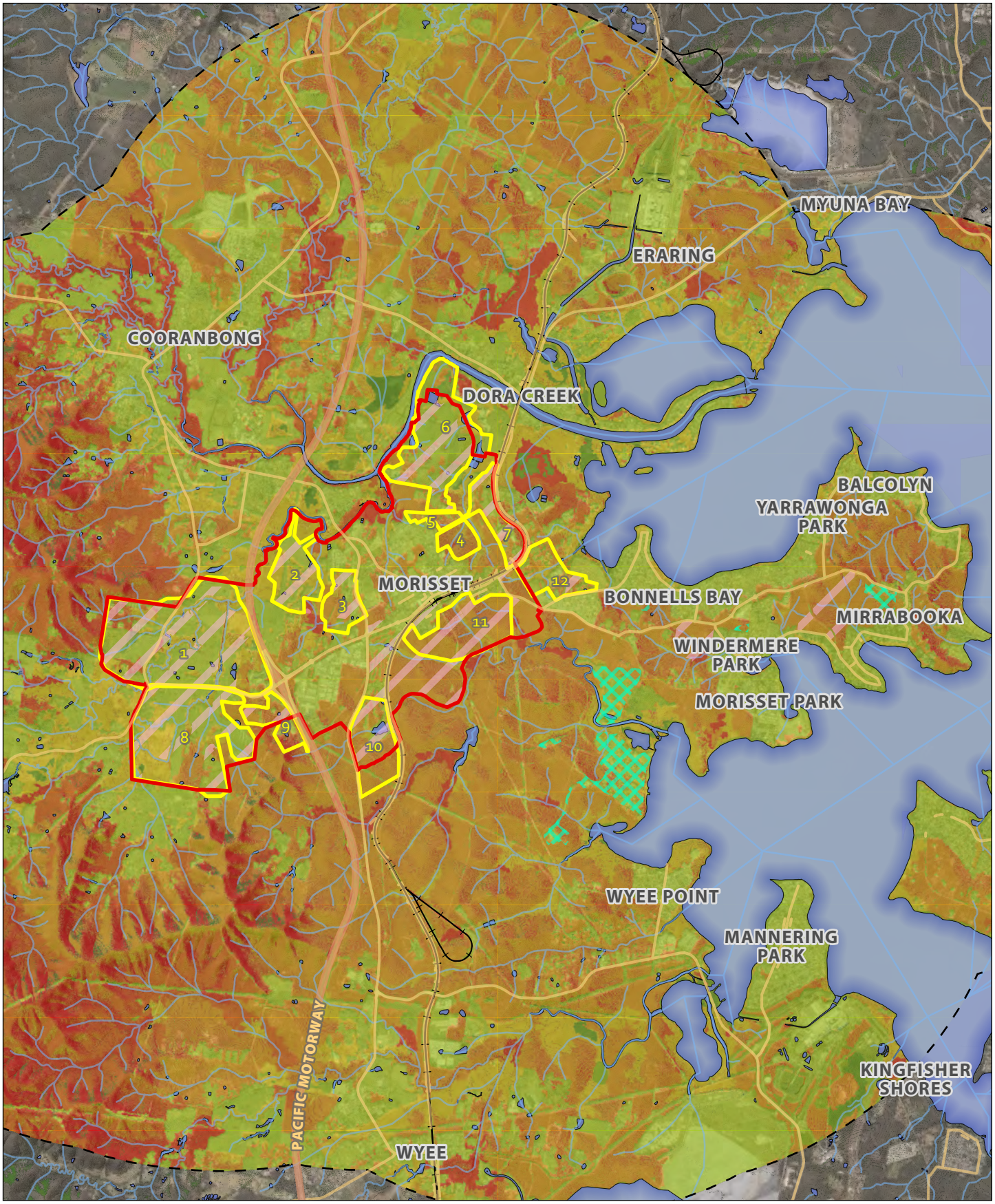
Kilometers

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 21: Fire Intensity (kW/m) South East to South West

CR Bushfire.



Legend

- Waterbody
- Regionally Significant Growth Area
- Study Area
- Additional Investigation Areas
- Investigation Areas
- Buffer - 5km

Fire Intensity (kW/m) N-SE

- <100
- 100 - 500
- 500 - 1,500
- 1,500 - 5,000
- 5,000 - 10,000
- 10,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- 75,000 - 100,000
- >100,000

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Date: 24/05/2024

0 1 2 4

Kilometers

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 22: Fire Intensity (kW/m) North to South East

CR Bushfire.

3.6 Climate and weather

As already noted, there is no current legislation or policy within New South Wales that requires the consideration of climate change within Strategic Bushfire Studies. Nevertheless, the 2020 NSW Bushfire Inquiry recommended that changing climate conditions and increased likelihood of catastrophic bushfire events should be accommodated within a future NSW strategic bushfire policy. With the Black Summer Bushfires being called "the new precedent" (Former NSW RFS Commissioner Shane Fitzsimmons), we can expect similar or worse conditions into the future. It is these conditions, or worsening conditions, which we should ultimately plan for in order to build resilience in new communities.

The McArthur Forest Fire Danger Index (FFDI) has historically been used as a metric for bushfire weather risk and to produce bushfire weather warnings. It uses an empirical scale and takes into account weather conditions and fuel dryness to predict potential rate of spread and flame height (Louis 2014). Whilst new and more comprehensive science in the Australia Fire Danger Ratings System has now replaced FFDI in the production of bushfire weather warnings, Risk Frontiers still promote FFDI as the best available metric to assess climate driven changes to bushfire weather. It also remains as the tool currently used within land use planning in NSW to calculate potential radiant heat flux at the building interface and apply appropriate mitigation. Long-term risk is calculated by considering return values of FFDI, in land use planning the return interval associated with the FFDI values used in NSW is 1:50 (*Planning for Bush Fire Protection 2006*).

The current FFDI used within land use planning development decisions in the Lake Macquarie Local Government Area is FFDI 100, which represents a worst-case scenario assuming there is no mitigation in relation to aspect or prevailing winds. This current FFDI of 100 used in *Planning for Bush Fire Protection 2019* is based on a 1 in 50 year return period, which would assume that the FFDI 100 event would occur once in a 50 year timeframe. It is unclear whether a 1 in 50 year return period is an appropriate timeframe for strategic planning, or whether a 1 in 100 year event may be the worst-case scenario, particularly in light of the evidence that climate conditions are intensifying. It is assumed that a 1 in 100 year event would be a higher FFDI, although to my knowledge there has been no publication regarding a 1 in 100 year return period for bushfire.

Research carried out by Dr Grahame Douglas in 2017 looked at the current FDIs used within *Planning for Bush Fire Protection* (PBP) and *Australian Standard 3959* and whether they were suitable, given climate change projections. The research uses Extreme Value Analysis as it's methodology and concludes that for the Williamtown Fire Weather District (the closest to the study area), FFDI 105 reflects a climate change design for a 1:50 return period.

The Bureau of Meteorology also undertook research to calculate FFDI return values over periods longer than the currently available datasets. The research published by Simon Louis uses a Generalised Pareto Distribution, or 'Peaks-Over-Threshold', and the Lucas 2010 fire weather dataset covering June 1972 to December 2009 for 16 weather stations in NSW. The closest weather station for this study is the Williamtown weather station. The estimates for a longer return period show a potential FFDI value of 110, compared to the 50 year estimated return period in the Lucas dataset of FFDI 103. This suggests that there is certainly a potential increase in FFDI expected based on a climate change factor and that a future FFDI may be higher than the current worst-case value of FFDI 100 currently being utilised within land use planning.

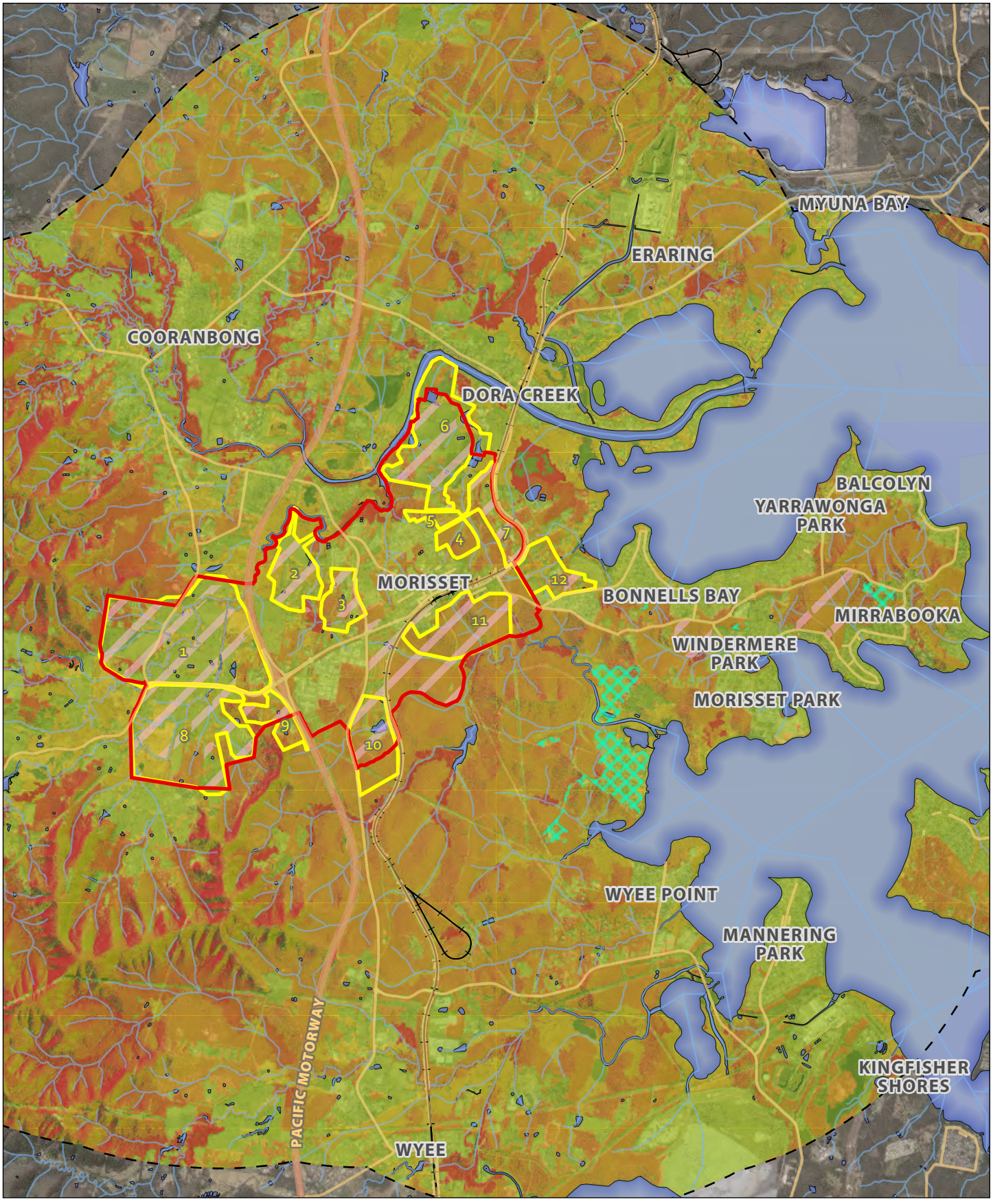
Fire weather or FFDI is represented within the land use planning response to bushfire protection within the calculation of Bushfire Attack Level (BAL) for construction and the distance required for vegetation management to create Asset Protection Zones. One way in which we can incorporate a climate change factor into assessment is to use a FFDI which represents the FFDI which may be experienced by future generations.

A previous Strategic Bushfire Study carried out for the Ingleside development precinct in 2015 is one which is held in high regard by the NSW Government and in the absence of any real guidance on the use of FFDI within strategic bushfire studies can be used as an example case. Within the Ingleside Bushfire Risk Assessment, an FFDI scenario higher than that recorded for the Sydney Metropolitan area was utilised to replicate a maximum FFDI under a climate change scenario. Without undertaking any specific fire weather modelling, an FFDI of 134 was adopted, which replicated the FFDI experienced in parts of Victoria on Black

Saturday, 7 February 2009. According to Bureau of Meteorology Fire Weather records, the highest FFDI recorded in Sydney was 116 in 2015 and the highest FFDI recorded close to the study area was FFDI 99 at Williamtown in 1997 (note, there may be localised variations in observed FFDI).

3.6.1 Fireline Intensity

To illustrate the potential increase in bushfire risk caused by the potential for climate change to increase the intensity of fire weather conditions, the Fireline Intensity for a North to Southwest climate scenario has also been mapped at FFDI 134 (Figure 23). This illustrates an FFDI greater than any published estimates regarding the potential increase in FFDI within this particular location and represents an absolute worst-case scenario. The maps show that the potential intensity of fire in the landscape will marginally increase, although it is difficult to spot the increases within the illustration as they are minor. It is worth noting that development within the subject area will remove some of the areas of higher intensity fires and provide some reduction in risk to the existing urban interface.



Legend

- Waterbody
- Regionally Significant Growth Area
- Study Area
- Additional Investigation Areas
- Investigation Areas
- Buffer - 5km

Fire Intensity (kW/m) N-SW FDI 134

- <100
- 100 - 500
- 500 - 1,500
- 1,500 - 5,000
- 5,000 - 10,000
- 10,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- 75,000 - 100,000
- >100,000

N

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Date: 24/05/2024

0 1 2 4

Kilometers

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 23: Fire Intensity (kW/m) North to South West FDI 134

CR Bushfire.

3.6.2 Asset Protection Zones

Increasing the size of asset protection zones on private land is a way to potentially add a climate change mitigation factor into the assessment. The use of an FFDI 134, mimicking the assessment used in the Ingleside Strategic Bushfire Study, could increase the private asset protection zones by up to 10 metres (where the slopes are steepest).

The dual use of recreational space as asset protection zones around the perimeter of proposed development is one way to incorporate additional asset protection zones. The designation of space as recreation space can be managed alongside bushfire protection to provide an additional layer of protection to the proposed community in light of potential climate change factors.

In order to be an asset protection zone (APZ), the vegetation should be managed such that any fire approaching from the hazardous vegetation is slowed and even stopped before it reaches the urban interface. The requirements and responsibility for this level of management would need to be very clear. Management will need to occur regularly such that vegetation doesn't grow back and recreate the threat. Clear delineation and signage of APZ space has been shown in previous studies to increase the propensity for the land to be regularly managed.

Council have indicated that the addition of any new public APZ would place too much strain on Council resources and it is therefore assumed that the addition of any new public APZ is not possible. The APZs for private lots may therefore need to be increased to add the extra protection required for climate change factors.

3.7 Vegetation Retention

Small pockets or 'fingers'/corridors of remnant vegetation were incredibly destructive during Black Summer and presented a much greater bushfire threat than would first have been imagined. The retention of vegetation within development sites needs to be carefully considered. The bushfire risk from any retained portions of vegetation needs to be calculated and mitigation to surrounding development provided accordingly. Wherever possible, retained vegetation should be managed as an asset protection zone. This would occur under a Vegetation Management Plan and responsibility for the management of the vegetation should be clear.

3.8 Overall Landscape Bushfire Risk

The overall landscape bushfire risk is determined to be very high. In the worst-case scenario, the mixture of high fuel load vegetation and undulating topography enables fire to ignite, build in intensity and travel at high speed and intensity towards the study area. The potential onset of climate change could serve to worsen existing conditions and the fireline intensity map created for FFDI 134 shows a marginally greater risk from landscape fires both in and around the subject sites under climate change conditions.

The development of some of the sites would potentially serve to reduce the landscape fire risk at the existing urban interface, such that existing communities are offered some relief from potential worst-case fire conditions. However, there would be a residual remaining landscape fire risk due to the retention of vegetation within and around any developed sites which can continue to transfer fire from the wider landscape into the urban interface.

Table 4 below discusses the landscape bushfire risk at each of the sites within the study.

Table 4: Overall landscape fire risk at each site

Site number	Overall Landscape Fire Risk Analysis
1	Bushfire risk – off site wet sclerophyll forest (WSF) to the northwest presents the biggest risk, the potential for intense fires to generate within the landscape and travel towards the site is very high. Fire within this vegetation could spread through corridors of forested wetland and across the grassland on site, exacerbated by steep

	slopes. There is also a risk of fire within DSF to the south which has the potential to transfer into the site through the DSF in the southeastern corner.
2	Bushfire risk – the risk at this site is mainly concentrated within the forested wetland to the north, west and east and the DSF/forested wetland to the southeast. The forested wetland and grassland within the site allows for fire to transfer across the site. The presence of the Pacific Motorway to the west of the site and urban areas north and east of the site reduces the size of fire prone vegetation parcels, however there is still a risk of fire transferring into the site.
3	Bushfire risk – the greatest fire risk is from the northwest where fire in the forested wetland to the north/west of site 2 might transfer across site 2 and into site 3. If site 2 remains undeveloped when site 3 comes forward for development, this risk will remain. Similarly, if the DSF remains within site 3, there will be a fire risk within the site that may need to be managed.
4	Bushfire risk – the bushfire risk is largely contained within the site itself. If it is largely developed then this risk will be significantly diminished. The risk to the urban area adjacent to the site would also be substantially reduced. Should site 5 be developed, the risk to site 4 would be reduced.
5	The bushfire risk is largely from the vegetation to the northwest, which can transfer into the site via the DSF on site. Site 4 and the vegetation beyond site 4 to the east also presents a risk to site 5, until such time as site 4 is developed.
6	Bushfire risk – the bushfire risk is largely from the vegetation to the south of the subject site. Fire can transfer into the site and travel through grassland. Vegetation to the north of the subject site and on the western side of Dora Creek is characterised by riparian vegetation, including freshwater wetland which carries a much smaller fire risk than DSF.
7	Bushfire risk – the bushfire risk is largely from vegetation to the west within and around site 4. There is also a wider landscape risk from the landscape beyond site 11, which has the potential to transfer towards the site through corridors of DSF. The separation of DSF to the east from the site via Main Road reduces the risk from the east.
8	Bushfire risk – there is a significant landscape risk to the northwest, west and south/southeast of this site due to large continuous areas of WSF and DSF which have connectivity into the site. In the northwest, fire within the WSF could transfer into the forested wetland offsite and into the site. In the southeast, fire within the DSF could transfer directly into the site either through grassland to the south or through the DSF itself.
9	Bushfire risk – the expanse of DSF to the south of the site presents a risk and fire can transfer into the site through the continuation of DSF. Fires from the west/northwest can also impact on site 9 if sites 1 and 8 remain undeveloped. Fires would potentially travel from the WSF into the forested wetland and unmanaged grassland in sites 1 and 8, travelling towards the site.
10	Bushfire risk – the risk on site has been reduced by development, risk to the south, east and west remains but this risk has already been mitigated on site.
11	Bushfire risk – there is significant bushfire risk from the landscape fire risk to the south of the site. There is significant potential for an intense and fast moving fire to impact the site, moving upslope towards the site.

12	Bushfire risk – the bushfire risk to this site is lower based on the site being within a rural-urban area. The main threat comes from the southwest, similar to site 11, the large expanse of DSF presents a significant risk.
Morisset Peninsula	The investigation areas along the peninsula are all subject to risk from DSF with pockets of steeper slopes involved. There is generally high fireline intensity potential around each of the Investigation Areas. Similar to the Investigation Areas, each of the Proposed Additional Investigation Areas is situated within a forested area with pockets of steeper slopes enabling a high fireline intensity.
Morisset Hospital and Waterfront	The Morisset Hospital site is surrounded by an expansive landscape of DSF with steeper slopes close to the site boundary, creating significant risk.

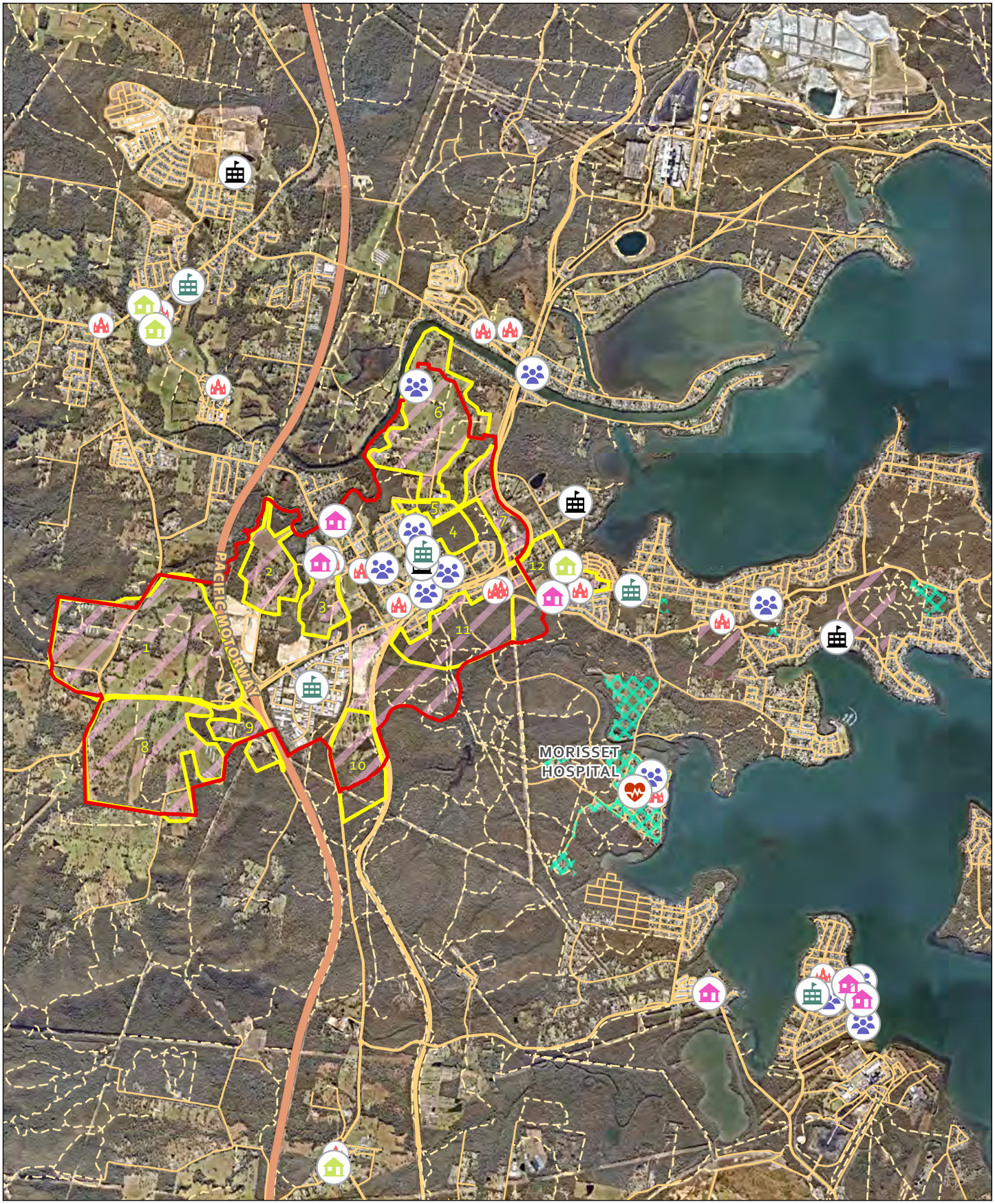
4 Land Use Assessment

4.1 Existing Risk Profile

Morisset is both a residential and commercial town with easy access to the M1 Pacific Motorway and the Northern Rail Line. The Morisset median age of 53 is higher than the median age of NSW (39) and the median age of Australia (38), which suggests an ageing population. A large proportion of the population (37.4%) is aged over 65, compared to 17.7% of the population of NSW and 17.2% of the Australian population as a whole.

The Central Coast Bush Fire Risk Management Plan describes the general bushfire risk within the Morisset urban area as 'High'. This is based on the likelihood of bushfire being 'possible' and the consequence of bushfire 'major'. This is discussed further in Chapter 6.

The map shown in Figure 24 below highlights the number of Special Fire Protection Purpose developments (classified by the *Rural Fires Act 1997*), places of public worship and community facilities within the Morisset area (please note this map provides a high-level overview and is not necessarily accurate). There are a number of retirement villages and aged care facilities within the existing urban area of Morisset, particularly around sites 2 and 3 and also within the East Morisset area, around site 12. These uses require additional support during an emergency evacuation response and may place additional pressure on road networks. Similarly, education and child care facilities would also require additional support in evacuation. Both the Morisset urban area and the Morisset Peninsula area include a number of educational facilities.



Legend

- Clip_OutFeatureClass_
- Education Facility
- Hospital
- Community Centre
- Aged Care
- Place of Worship
- Pre-School/Childcare Centre
- Retirement Faciltiy
- Motorway
- Major Road
- Minor Road
- Track-Vehicular
- Path
- Investigation Areas
- Additional Investigation Areas
- Study Area
- Regionally Significant Growth Area

N

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Date: 24/05/2024

0 250500 1,000

Meters

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 24: Significant Assets

CR Bushfire.

4.2 Proposed Risk Profile

The proposed masterplan is situated in an area of significant bushfire risk, as detailed in Chapter 3 of this SBS above. There is no doubt that significant mitigation is required to reduce the risk profile to both existing and proposed communities. The principles of Chapter 4 of *Planning for Bush Fire Protection 2019* are relevant and in considering the potential land use change and development of the sites within the study, the aim must be to:

- Reduce the exposure of the development area to bushfire risk;
- Ensure evacuation potential is prioritised;
- Reduce the risk to the existing development and ensure bushfire protection strategies are not impacted;
- Balance any environmental constraints such that bushfire risk is not compromised.

Different land uses are proposed for the different sites within the study, attracting different bushfire risk and bushfire protection principles. Table 5 below looks at these principles site by site.

The NSW Government has recently introduced reforms to create more low and mid-rise housing. The new laws mean that certain zonings will allow for higher densities of housing, regardless of the land zoning determined by Council. The reforms will "*fast-track a greater diversity of homes like residential flat buildings of 3-6 storeys, terraces, townhouses, duplexes and smaller 1-2 storey apartment blocks in suburbs where they are not currently allowed*". The proposed allowances include:

- Dual occupancies (two separate homes on a single lot), such as duplexes, in all R2 low density residential zones across all of NSW.
- Terraces, townhouses and two storey apartment blocks near transport hubs and town centres in R2 low density residential zones across the Greater Sydney region, Hunter, Central Coast and Illawarra (the Six Cities region).
- Mid-rise apartment blocks near transport hubs and town centres in R3 medium density zones and appropriate employment zones. This will mean more housing just a short 10-minute walk (800m) from transport hubs, shops and amenities.

This creates some concern from a bushfire risk perspective as higher density residential development may be possible in this area regardless of any strategic assessment of bushfire risk. Where any new R2 or R3 zonings are adopted, it is imperative that a Strategic Bushfire Study for the rezoning considers the ability to increase the available density under these reforms and proposes mitigation measures accordingly.

Table 5: Land Use Risk Profile

Site number	Existing Land Use	Proposed Land Use	Land Use Bushfire Risk Profile
1	RU2 Rural Landscape, C2 Environmental Conservation, SP1 Mining	Industrial/Agricultural/Conservation investigation area	The highest potential bushfire risk profile for this site would be a potential industrial land use. The staff/floorspace ratios in an industrial land use tend to be lower than other land uses and there is an assumption that there would be no overnight accommodation on site. Evacuation of employees in a bushfire event is a major consideration and any future industrial use would require an emergency management plan for bushfire events. An agricultural land use has an even lower risk profile, the staff to floorspace ratios are generally very low, although some of the literature suggests that the agriculture uses proposed may be more intensive. Any accommodation associated with an agricultural land use would potentially be assessed as residential accommodation, potentially requiring BAL assessment and asset protection zone, but

			would be low density and protection can be achieved. An agricultural use in itself can present a fire risk due to some crops being flammable and the needs for ongoing management plans. If agricultural is included with industrial, the risk presented by an agricultural use would need to be included within a bushfire risk assessment for the industrial land use. If a split zoning includes a conservation element, the land included in the conservation zoning would need to be part of any bushfire risk assessment for built form land uses, including industrial. The structure of the vegetation within the conservation zoning can present a fire risk to built form industrial or agricultural land uses.
2	RU2 Rural Landscape	Employment investigation area	An employment land use could have a fairly high staff to floorspace ratio and any potential employment land use would require an emergency management plan for bushfire. Evacuation of employment uses would be a key consideration, this is considered in Chapter 5. It is assumed that no overnight accommodation would be associated with the employment use, if this were the case, the risk profile of the use would be greater.
3	RU6 Transition	Residential investigation area	Residential land uses carry a high-risk profile in bushfire terms. Both evacuation potential and ability to incorporate protective asset protection zones will need to be investigated prior to any land release. Evacuation is discussed in Chapter 5 below. The northern boundary of the site adjoins Gimberts Road and The Grange over 55s community. There are a handful of other commercial and residential land uses along Gimberts Road. Part of the site is included in the Gimberts Road Precinct Area Plan in relation to the Gimberts Road Industrial Area. Parts of the site appear to be cleared of vegetation pending new development. It is likely that the southern portion of the site will change in character. With it, the bushfire risk will be reduced in the southern portion of the site. Based on the landscape scale bushfire risk identified at this site, residential development would potentially be appropriate, providing asset protection zones can be established and the potential for full evacuation of any residential development can be established. Evacuation – There could be evacuation issues associated with the Lifestyle village. Gimberts Road is also home to The Morisset Showground, which is located on the eastern side of Freemans Drive and holds events. The evacuation risk associated with events should be factored into any emergency management scenario for growth in this area.

4	R2 Low Density Residential	Potential future rezoning of part of this area to an environmental conservation zoning	It is understood that the future of this site is uncertain. Due to its environmental properties, it is possible that a split zoning may be an option which means part of the site may be released for residential development. Residential development on the site would therefore need to be mitigated to take account of the bushfire risk remaining within any environmentally zoned land on the site. The proximity of the site to the existing urban area reduces the risk profile. Any residential development on this site would reduce the amount of vegetation and therefore the risk profile of the existing community.
5	R2 Low Density Residential	Residential investigation area	Similar to Site 4, any residential development on this site would need to be mitigated to respond to the surrounding bushfire risk, which may come from Site 4 or the surrounding areas of remnant vegetation, on or off site. The proximity of the site to the existing urban area is a positive and the development of the site could serve to reduce the overall bushfire risk to the existing community.
6	RU2 Rural Landscape, C2 Environmental Conservation	Residential investigation area	The residential development of this site would vastly reduce the bushfire risk across the landscape in this location. The main risk comes from the south of the site and may be reduced if sites 4 and 5 are developed. It is recommended that the site is not developed for residential land as it is currently isolated if a bushfire event were to occur. However, if residential land is proposed, then the development of the site would need to be carefully planned to ensure residents could evacuate via a two-way road network with an alternative direction of travel. Connectivity with the existing urban area would be critical and operational access to the vegetation south of the site would also be required to undertake hazard mitigation and active firefighting operations.
7	RU6 Transition	Residential investigation area	The residential development of this site would reduce the general bushfire risk. The new development would need to be mitigated by providing appropriate asset protection zones and access. The connectivity of the site to the existing urban area is a positive feature as it is unlikely that development would be isolated.
8	RU2 Rural Landscape, C2 Environmental Conservation	Employment investigation area	An employment land use could have a fairly high staff to floorspace ratio and any potential employment land use would require an emergency management plan for bushfire. There is a significant bushfire risk at this site which would need to be addressed through appropriate mitigation. Evacuation of employment uses would be a key consideration, this is considered in Chapter 5. It is assumed that no overnight accommodation would

			be associated with the employment use, if this were the case, the risk profile of the use would be greater.
9	RU2 Rural Landscape, C2 Environmental Conservation, SP1 Mining	Employment investigation area	An employment land use could have a fairly high staff to floorspace ratio and any potential employment land use would require an emergency management plan for bushfire. The risk at this site is dependent upon the potential redevelopment of Site 8, which would reduce the risk of fires from the west impacting the site. The risk to the south would need to be mitigated through appropriate emergency response mechanisms, such as asset protection zones, appropriate access and built form protection measures. Ease of access to the M1 Pacific Motorway is a positive feature of this particular site and should enable early evacuation. Evacuation of employment uses would be a key consideration, this is considered in Chapter 5. It is assumed that no overnight accommodation would be associated with the employment use, if this were the case, the risk profile of the use would be greater.
10	C2 Environmental Conservation and RE2 Private Recreation	Residential investigation area	A large portion of this site has already been developed and mitigation provided.
11	RU6 Transition, RE1 Public Recreation	Residential investigation area	This site is situated in an area of significant bushfire risk. The residential development of this site is a particular concern, particularly in light of the traffic congestion issues discussed in Chapter 5. Any residential development on this site would need to be subject to significant mitigation measures, which may go over and above those measures required by *Planning for Bush Fire Protection 2019*. For instance, greater asset protection zones may be required and/or dual use of public land for asset protection and recreation. The fire trails within the land would need to be assessed to determine whether any are required to stay within a development layout and to ensure that no fire trail is cut off by development. The residential development of this land should be approached with caution and with best practice bushfire protection in mind.
12	RU4 Primary Production Small Lots	Residential investigation area	There is significant bushfire risk to the south of this site, however the site has good connectivity to the existing urban area. The development of site 11 would significantly reduce the risk to this site. The intensification of the site would generally reduce the bushfire risk in the area. The traffic congestion issues are a concern for this site and would need to be overcome prior to the site's development.
Morisset Peninsula	RU6 Transition	Fishery Point Road sub-precinct – Recreation or Conservation	The development of this site would reduce the risk within the site, to the existing urban area to the east and north and also to the Lakeside Adventist site. There would be significant opportunity in developing this site, although the Discussion Paper

			suggests that this site is more suitable for recreation or environmental conservation purposes. If the site were to be utilised for recreation, some consideration could be given to ways in which this recreation use could be adapted to also provide some level of protection to the urban area situated on the eastern boundary of the site.
	C3 Environmental Management	Lakeside Adventist Church – Future land use investigation	The main landscape risk is situated north and east of the subject site and on the southern side of Fishery Point Road. The site has direct road access to Fishery Point Road and travel in either an easterly or westerly direction is possible, although through bushfire prone vegetation. Travel in a northerly direction is also possible along Pearson Street. Any residential development of the site should consider the risk to the north and east primarily and would need to include private asset protection zones to mitigate the risk. Commercial development of the site would be more appropriate, although evacuation of the site away from the bushfire threat would need to be carefully considered.
	C2 Environmental Conservation	Bay Vista Road sub-precinct - Environmental and future land use investigation	There is a large landscape of heavily bushfire prone vegetation within this area. The development of this site would somewhat reduce that risk, but this would need to be balanced with the need to retain vegetation on site for environmental conservation purposes. The need for good bushfire mitigation on this site may conflict with environmental qualities of the vegetation. Road access to this site traverses bushfire prone vegetation, the evacuation of the site would therefore be required to be carefully considered. Evacuation in a southerly direction is possible, although there are limited places to shelter within the existing urban area. Existing residents in this area may also be evacuating.
	RU4 Primary Production	Hannell Street sub-precinct - Intensification/development	The area is already occupied by primary production uses and some of the land is already therefore managed. This reduces the existing bushfire risk within this area. Road access is taken from Fishery Point Road in a east-west or west-east direction and Hannell Street in a northerly direction. Evacuation in a northerly direction away from the bushfire risk is possible. Connectivity with the existing urban area is good. Intensification of uses within this area may be appropriate, subject to detailed assessment of the bushfire risk and evacuation potential.
	Ru6 Transition	Mirrabooka Quarry sub-precinct – Future land use investigation	This site is surrounded by bushfire prone vegetation and the risk is somewhat high. Evacuating along Fishery Point Road to the west leads through heavily bushfire prone vegetation. To the east there are residential properties along Fishery Point Road, although a wide landscape of fire prone vegetation and limited places for shelter. Residential

			development of this site should be avoided, unless the risks identified can be successfully mitigated.
Morisset Hospital and Waterfront	SP2 Health Services Facilities and RU6 Transition	Recreation and future land use investigation	This area is adjacent to the Lake Macquarie State Conservation Area. The bushfire risk within the landscape is significant and the ability to mitigate that risk through vegetation management is limited. Access is through vegetation which is bushfire prone and could easily be closed in the event of a bushfire. The use of the site for recreational purposes is appropriate, providing the risks to visitors have been assessed and any required mitigation applied. For example, a bushfire emergency management plan may review the evacuation requirements of any recreation facility and may require closure on Extreme or Catastrophic Fire Danger Days. Any residential development in this area should be avoided. It is extremely isolated from the Morisset urban area and could be cut off in the event of a bushfire.

Other principles that are relevant to the assessment of land use are:

- Wherever possible, the siting of future dwellings should be away from ridge-tops and steep slopes, within saddles and narrow ridge crests to avoid building in the areas with the highest bushfire risk profile.
- The perimeters of any future subdivision exposed to the bush fire hazard should be minimised. Hourglass shapes, which maximise perimeters and create bottlenecks should be avoided.
- Isolated development should be avoided, connectivity with existing urban areas and good evacuation routes should be maximised for the following reasons:
    - The number of people directly exposed to the hazard should be as low as possible.
    - Firefighter exposure to the hazard should be minimised.
    - Ongoing mitigation costs should be minimised.
    - Ongoing mitigation resourcing should be minimised.
    - Smooth evacuation should be promoted.
- Any new Special Fire Protection Purpose developments, such as schools, retirement villages and hospitals, should be restricted to the lowest bushfire prone areas and close to the existing urban are wherever possible.

5 Evacuation and Movement Corridors

Evacuation is a key function of risk management with regards to bushfire planning. The evacuation process has five stages (AIDR, 2023) as shown in the diagram below:

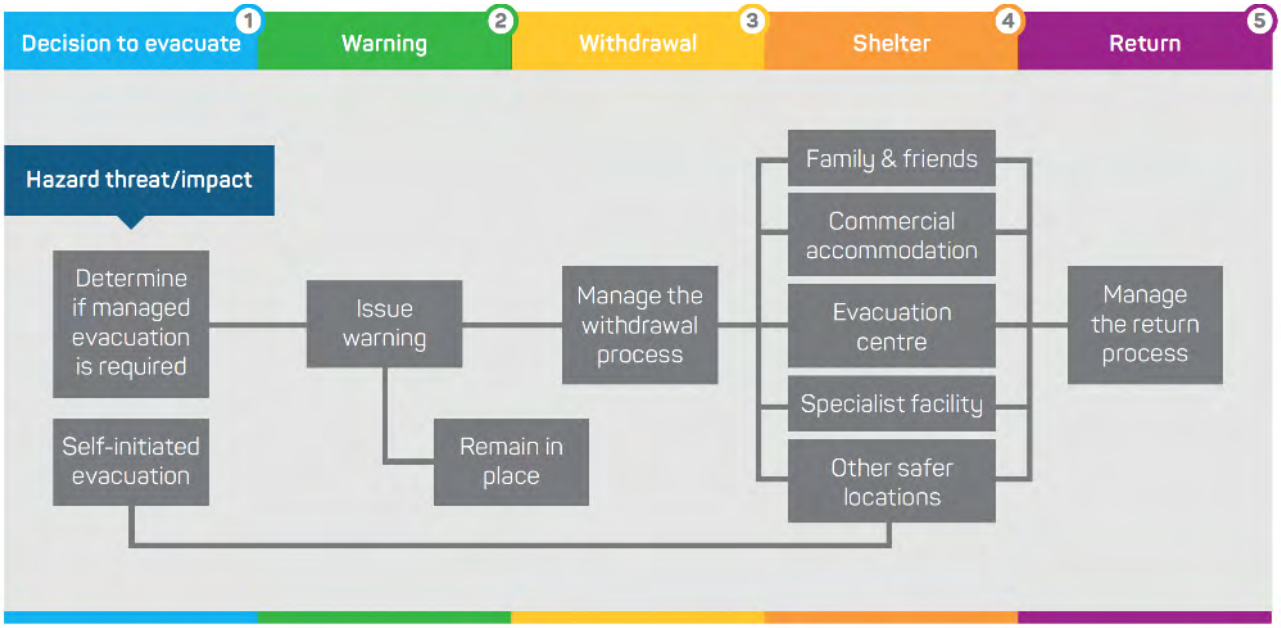


Figure 25: Evacuation Planning Process (AIDR Evacuation Planning Handbook 2023)

These decisions sometimes need to be taken very quickly during a fast onset bushfire and can impact large numbers of people. The Land Use Planning for Disaster Resilient Communities (AIDR) Handbook recommends that strategic land use planning can assist in facilitating and improving response actions through suitable settlement layouts.

5.1 Access routes

The settlement of Morisset in the Lake Macquarie region has a population of 4,078 people, as well as 1,902 private dwellings, and a median age of 53 (data from Australian Bureau of Statistics (ABS) 2021 census). The settlement is accessed directly from the M1 Pacific Motorway via the major road access route B53 Dora Street, which provides the main spine through the centre of Morisset from west to east. The B53 continues north to connect Morisset with Dora Creek, Eraring Power Station, Myuna Bay and other Lake Macquarie settlements, including Wangi Wangi, Arcadia Vale and Buttaba.

Fishery Point Road connects Morisset to settlements further east of Bonnells Bay, Windermere Park, Morisset Park, Yarrawonga Park, Balcolyn, Silverwater, Sunshine, Mirrabooka and Brightwaters. Collectively, these settlements east of the Morisset area have a population of 9,698 (ABS 2021) and these needs to be taken into consideration in the evacuation study.

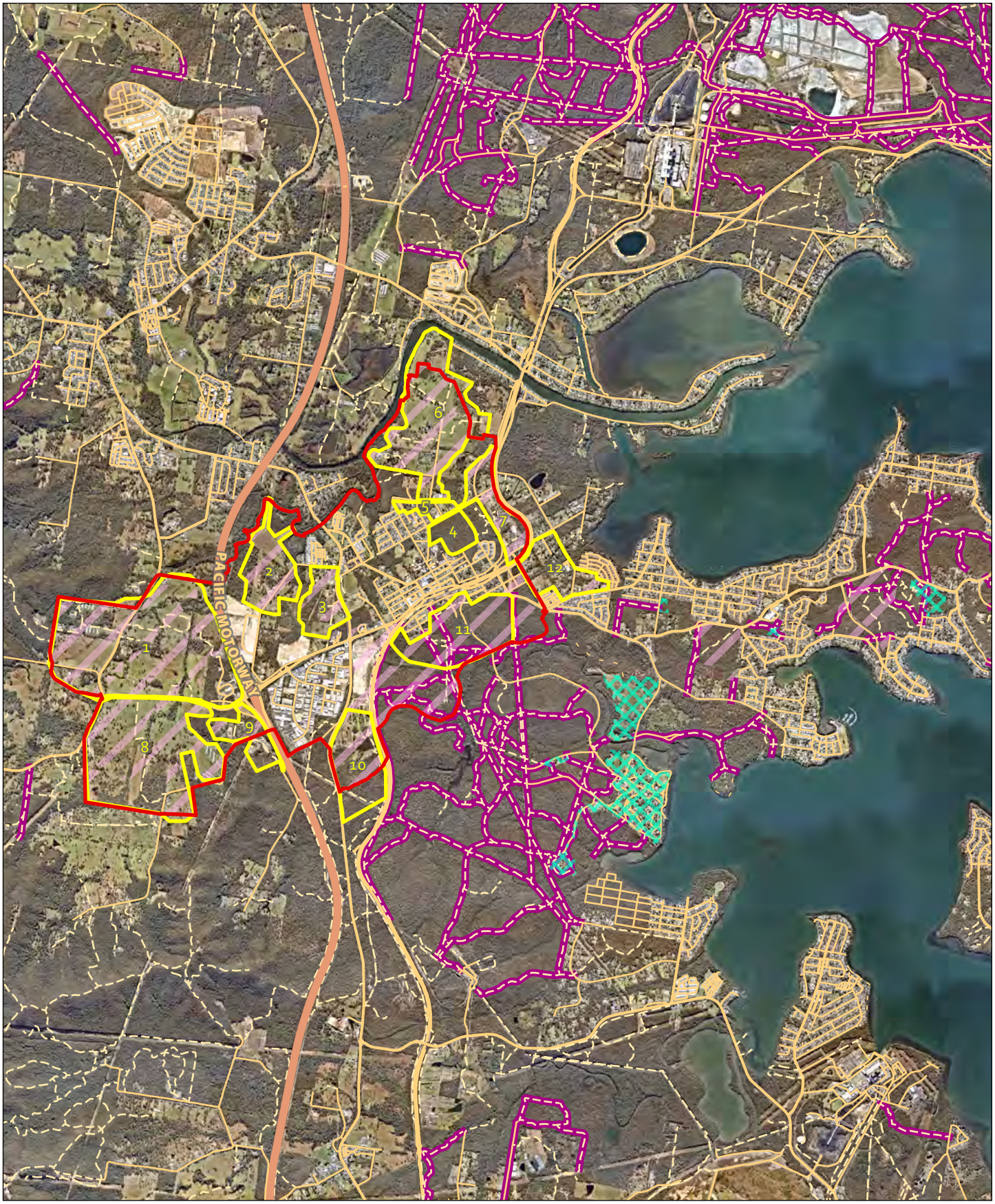
The fact that the population is ageing points to a large proportion of the population potentially requiring some assistance in evacuation. This can stretch road networks and emergency management resources and needs to be taken into consideration when assessing evacuation potential.

The M1 Pacific Motorway would be the main route for people evacuating Morisset in the event of a threatening bushfire. If a fire is threatening to the south of Morisset, people can access the highway travelling north. If a fire is threatening from the north, people can access the highway to travel south. The route can be threatened by fire from both the west and south of Morisset and could be impacted either by fire or by the smoke generated by a fire. The safety of people entering the highway to travel away from a bushfire will be dependent upon fire activity around the Pacific Motorway for quite a distance either north or south of Morisset. Should the Motorway be closed in either direction, residents of Morisset, and the study area would be restricted to staying within the locality, rather than being able to move away from the area.

Access to the Pacific Motorway and away from Morisset is taken from the B53 and the settlements to the east of Morisset use Fishery Point Road to access the B53 and the Pacific Motorway. The bushfire risk from the south of Morisset is most likely to create a road closure issue in this area as the vegetation is close to the existing settlement and the B53. There is also a pinch point along Fishery Point Road between the southeastern edge of Morisset and the western edge of Bonnells Bay which could also be closed, preventing east-west and west-east travel between Morisset and Bonnells Bay.

The use of Macquarie Street for residents to head north away from the study area is a possibility, however the risk of fire along this route would also need to be considered. There is forest within Dora Creek Park and along the Wangi Road on the approach to Myuna Bay and Wangi Wangi. The risk of ignition in these areas, depending upon prevailing weather conditions, would need to be considered prior to directing traffic along this route.

A road network map is provided at Figure 26.



Legend

- Motorway
- Major Road
- Minor Road
- Track-Vehicular
- Path
- Classified Fire Trail
- Investigation Areas
- Additional Investigation Areas
- Study Area
- Regionally Significant Growth Area

N

DKGIS

Date: 24/05/2024

0 250500 1,000

Meters

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 26: Access

CR Bushfire.

The B53 has been noted by local residents and traffic engineers to be particularly congested on a regular basis. I visited Morisset in preparing this study and observed the general congestion along this main spine and within the town centre generally. Dora Street through the Morisset Town Centre has been identified within the Morisset Transport Scoping Study (Bitzios Consulting, June 2022) as being a key conflict point with high Movement and Place values, meaning that a high level of traffic moves through this area to get to destinations and it also attracts people to use the facilities within the town centre. Other areas of Morisset that attract conflict between movement and place include the Dora Street/Morisset Country Club Intersection, areas in proximity to Morisset railway station (Dora Street and Macquarie Street) and Station Street/Bridge Street.

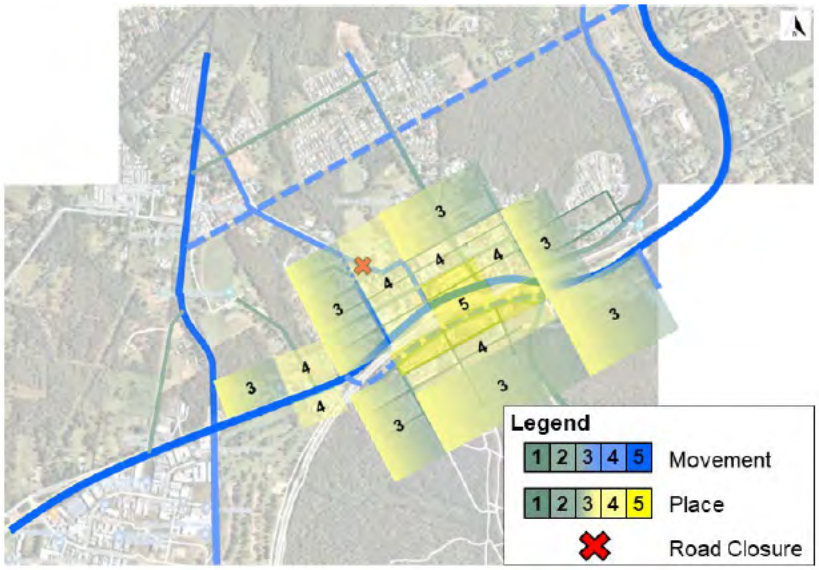


Figure 14: Movement/Place Conflicts (source: Transport Scoping Study)

Several network upgrades were identified by the Transport Scoping Study to respond to different growth scenarios. Under a Low Growth Scenario, works required include intersection upgrades, four laning Dora Street and Doyalson Street, providing a new bypass via Macquarie Street (south of the railway line) and posted speed limit changes. In a High Growth Scenario, works required include the same intersection upgrades and speed limit changes as the Low Growth Scenario, "four-laning" Dora Street and Doyalson Street, providing a new alternate route via Awaba Street and changing to one way circulation of Yambo Street and Station Street as an anti-clockwise loop. The two growth scenarios can be seen in Figures 28 and 29 below.

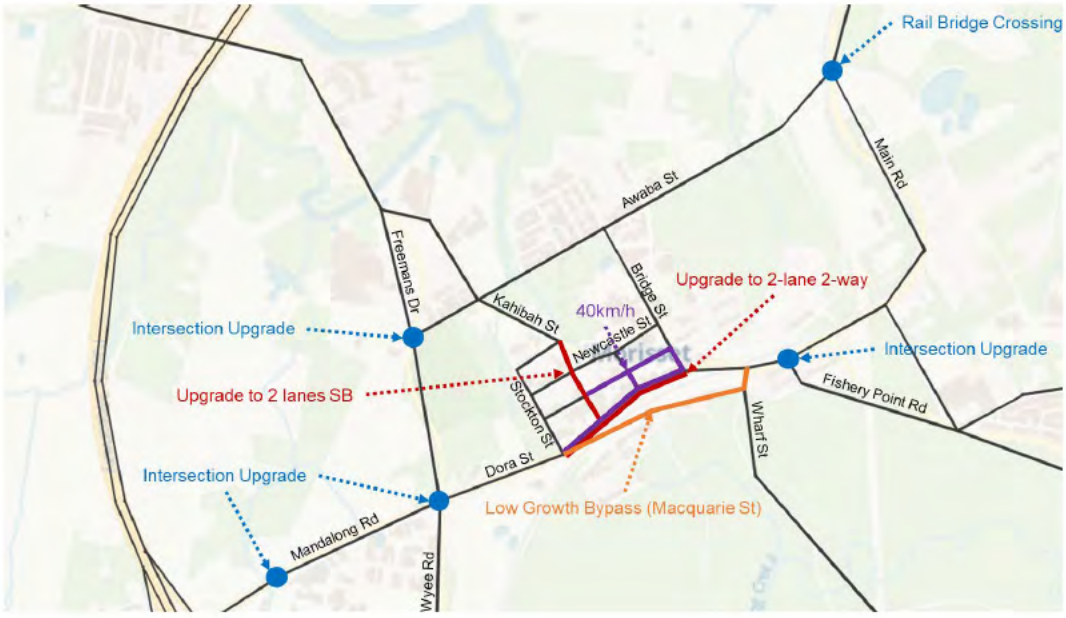


Figure 15: Low Growth Scenario Recommendations (source: Transport Scoping Study)

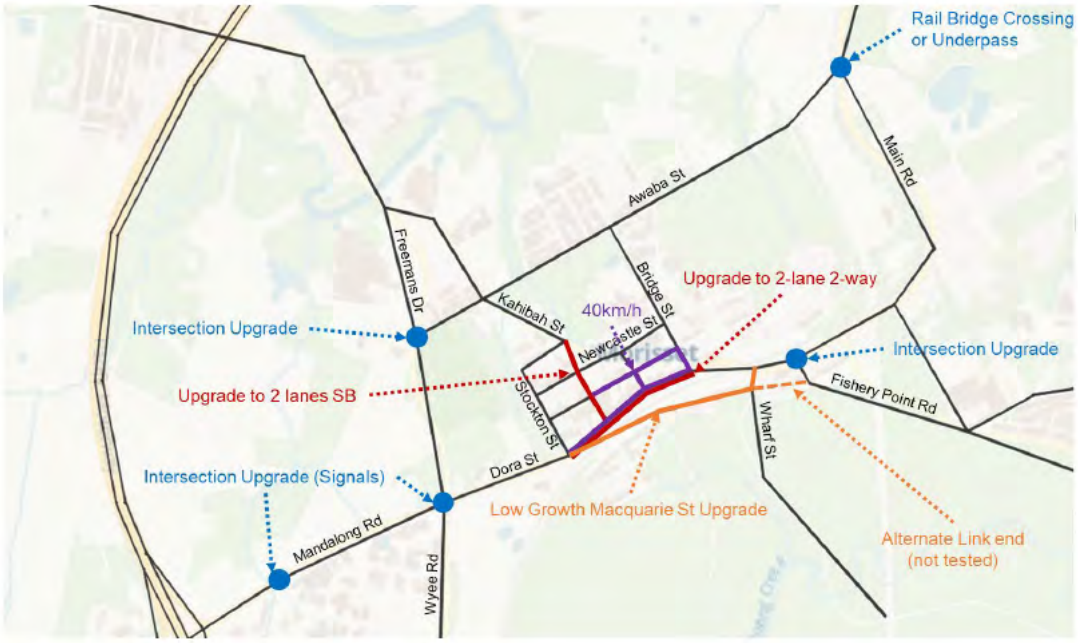


Figure 16: High Growth Recommendations (source: Transport Scoping Study)

The Transport Scoping Study did not take into account a bushfire emergency evacuation event and the results of the study relate only to growth scenarios. In considering the current levels of congestion in the Morisset town centre, there is cause for concern that if residents within and around the town centre area needed to move away from Morisset due to an approaching bushfire, there is likely to be congestion. Similarly, if residents were to move towards a refuge or Neighbourhood Safer Place, they are likely to become caught in congestion. This in itself is a major concern for the consideration of growth within this area.

The Morisset Place Strategy Discussion Paper mentions the Mandalong Road Upgrade. Mandalong Road is a State Road and funding is allocated to a widening of Mandalong Road between Gateway Boulevarde and Wyee Road to provide two travel lanes in each direction and upgraded intersections. This will likely ease the traffic flow close to the M1 Motorway intersection and may have a flow-on effect of reducing traffic elsewhere on the network.

It is recommended that further detailed traffic studies are undertaken once a realistic growth scenario is established to identify any additional traffic requirements for a bushfire emergency event. This detailed study should consider potential ignition scenarios, smoke drift and potential for road closure.

5.2 Individual Precinct Access Analysis

The current network challenges in the centre of Morisset are a concern for the introduction of new residents into the study area. Any of the sites which propose new residential development cannot therefore proceed without analysis of how the increase in people numbers would impact evacuation potential in the event of a bushfire.

Development of the Central Precinct, which includes Site 4, could have the potential to increase the number of dwellings in this area from 716 to 2225 and the number of people from 1665 to 4922. In an emergency scenario, this has the potential to put significant additional pressure on the ability for people to evacuate should a bushfire approach. Given that the bushfire risk is lower in this location due to its urban character, especially if Site 4 is also developed for residential purposes, it may be that residents in this area would not need to evacuate. It is human nature that when a bushfire approaches, people see smoke and embers in the air and prefer to leave their home so it is still important to assess the evacuation situation. Designing houses that are well protected in the event that residents adopt a 'shelter in place' approach is also imperative.

The M1 Gateway Precinct is earmarked as a regionally significant employment area, with the potential to create up to 11,200 additional jobs. As a whole, this area is subject to the highest level of bushfire risk, but

also has the best access to the M1 Pacific Motorway to evacuate people away from the area. As this area is not earmarked for residential development, the risk profile is lower. The development of a strategic emergency management plan may be beneficial for this precinct to understand the triggers for evacuation of the employment areas and the potential timing of evacuation.

The North Morisset Precinct, including Sites 5, 6 and 7 has the potential for an uplift in the number of dwellings from 593 to 2034 and an uplift in the number of people from 1403to 4546. This is a significant increase in the number of people utilising this area. The area is subject to a lower bushfire risk profile and even more so should site 6 be developed. However, a residual risk will remain in this area and the development of a transport network which supports bushfire protection and evacuation is crucial. A one-road-in and out system towards Dora Creek could potentially trap people and the consideration of at least one alternative evacuation route in this area is imperative. Funnelling people from this area towards central Morisset in a bushfire emergency could add to the congestion issues already being experienced.

The West Morisset Precinct, which includes Site 3 has the potential for an increase in the number of dwellings from 256 to 555 and the number of people from 432 to 1388. Access upgrades would be required to support this number of additional people and this should take into consideration emergency management. The area is currently occupied by over 55s retirement living. Any additional challenges associated with seniors housing should be taken into consideration when reviewing access requirements. The proximity of this site to the M1 Motorway is a positive and movement towards the motorway for evacuation should be encouraged.

The South Morisset Precinct, Site 11, has the potential to upgrade from a current 307 dwellings to 1597 dwellings and 788 people to 3877 people. This is a significant uplift in the number of residents in this area and is concerning due to the bushfire risk within the vegetation to the south which presents a real need for residents within this area to potentially evacuate in a bushfire event. The need for evacuation of residents is compounded by the current congestion problems within the Morisset town centre and there is significant concern that evacuation may not be possible. This should be subject to a full and detailed investigation prior to this site being zoned for residential development, particularly in light of the government's low and mid-rise planning reforms. The aim should be to ensure that there is enough road capacity to evacuate each new resident in a timely fashion. Options such as refuges should also be considered to provide additional support within this area.

The East Morisset Precinct, which includes Site 12 is an investigation area for low/medium density residential development. The site is occupied by small lot agricultural production uses and is connected well to the existing urban area of Morisset and the Morisset Peninsula. Evacuation away from this site could take place either in a northerly direction towards Dora Creek, an easterly direction towards the Morisset Peninsula or a westerly direction through the centre of Morisset. Having different directional options available for evacuation is a positive feature as direction of travel can respond to the direction of an oncoming fire. However, there are challenges involved due to the congestion identified within the centre of Morisset, the bushfire prone vegetation situated along the northerly evacuation route and bushfire prone vegetation/limited sheltering facilities along the easterly evacuation route. Existing residents may also be evacuating along these routes. Some of these challenges would need to be overcome if this area is to be intensified in land use.

The Morisset Peninsula is currently a mix of low and medium density housing and is fairly heavily populated. The area is also a tourist destination and the Place Strategy Discussion Paper highlights the opportunity for growth and diversification within this area. The intensification of use could lead to traffic impacts along the Fishery Point Road and local distributor roads. The traffic impacts of development along the peninsula and how emergency evacuation may be impacted would need to be considered in a detailed study of the area. There is a large amount of bushfire prone vegetation within the landscape and a large amount of existing properties subject to bushfire risk with a potential need to evacuate. Intensification of uses within this area could exacerbate these problems if risk is not sufficiently mitigated. There are no identified Neighbourhood Safer Places or refuges within this area, these are options that would need to be considered for additional emergency support.

The Morisset Hospital and Waterfront site is a heritage precinct used historically for health services. The NSW Gvoernment has been winding down health services at the site and it's future use is unknown but is

likely to be maintained, conserved and interpreted through adaptive re-use. An area north of the Morisset Hospital is zoned RU6 transition and originally considered for recreational purposes. Neither the Morisset Hospital site or the area north of the hospital would be suitable for residential development due to the isolation from the existing Morisset urban area and the transition of access roads through heavily bushfire prone vegetation. Recreational uses may be appropriate with applied mitigation and emergency management considerations.

5.3 Strategic Fire Trails

There are a number of fire trails within the study area, particularly south of Site 11 within the Dry Sclerophyll Forest, which are identified by Lake Macquarie City Council as being both strategic and tactical trails. A Strategic Fire Trail is one which is registered by the NSW RFS and maintained to provide strategic advantage in bushfire events, but also for hazard mitigation works. No fire trails within the Morisset area are recorded on the NSW RFS register of Strategic Fire Trails.

One potential mitigation measure is to identify one or more fire trails that can provide strategic firefighting advantage to one or more of the subject sites earmarked for residential development. These fire trails could be assessed to be included within the NSW RFS register of Strategic Fire Trails and be managed accordingly.

The ability to provide a Strategic Fire Trail would not only benefit the new community but would provide significant uplift in the risk profile of the existing community. This would be a huge advantage in improving the resilience of the proposed community to bushfire risk. The process of negotiating with the NSW RFS to initiate the fire trail registration process can take some time and would be dependent upon the landowner agreeing to the proposal. A mechanism would need to be identified through any development control process to ensure that this significant mitigation measure is followed through.

5.4 Connectivity

Any new residential development will need to be well connected to the existing urban area. Isolated development is not recommended as it creates challenges for evacuation and firefighting. Any development which could be cut off in the event of a bushfire, with fire on more than one side, can potentially place both residents and responders in danger.

Perimeter roads are required around the entirety of any residential development to provide good operational access for firefighting/hazard mitigation and to provide two-way access/egress for residents in the event of a bushfire emergency.

6 Emergency Services

6.1 Bush Fire Risk Management Plan

The Morisset area is covered by the Central Coast Bush Fire Risk Management Plan 2020-2025. The plan sets out all assets at risk from bushfire within the area and prescribed treatments to reduce bushfire risk over a five year program.

The climate in the eastern areas of the Central Coast Bush Fire District is described as being associated with coastal conditions, general north-westerly winds accompanied by high daytime temperatures and low relative humidity. Occasional dry lightning storms occur during the bushfire season, which runs from August to March.

The Bushfire Risk Management Plan describes population growth in the area as driving migration patterns and residential demand due to demand from metropolitan Sydney and housing affordability.

The main sources of ignition in the Central Coast Bush Fire Management Committee area are described as being:

- Illegal burning activity
- Escapes from legal burning
- Arson and incendiarism
- Ignition of abandoned/stolen motor vehicles
- Lightning
- Arcing electrical power lines

The following Table 6 shows the assets within the study area and the treatment measures assigned to each asset. The main treatment measures applied within the study area are an Asset Protection Zone (APZ) and Land Management Zone (LMZ) situated around much of the urban area of Morisset. New development within the area would alter the need for APZ and LMZ around the urban area. The biodiversity implications of the need for such APZs around future settlements should be considered prior to development occurring.

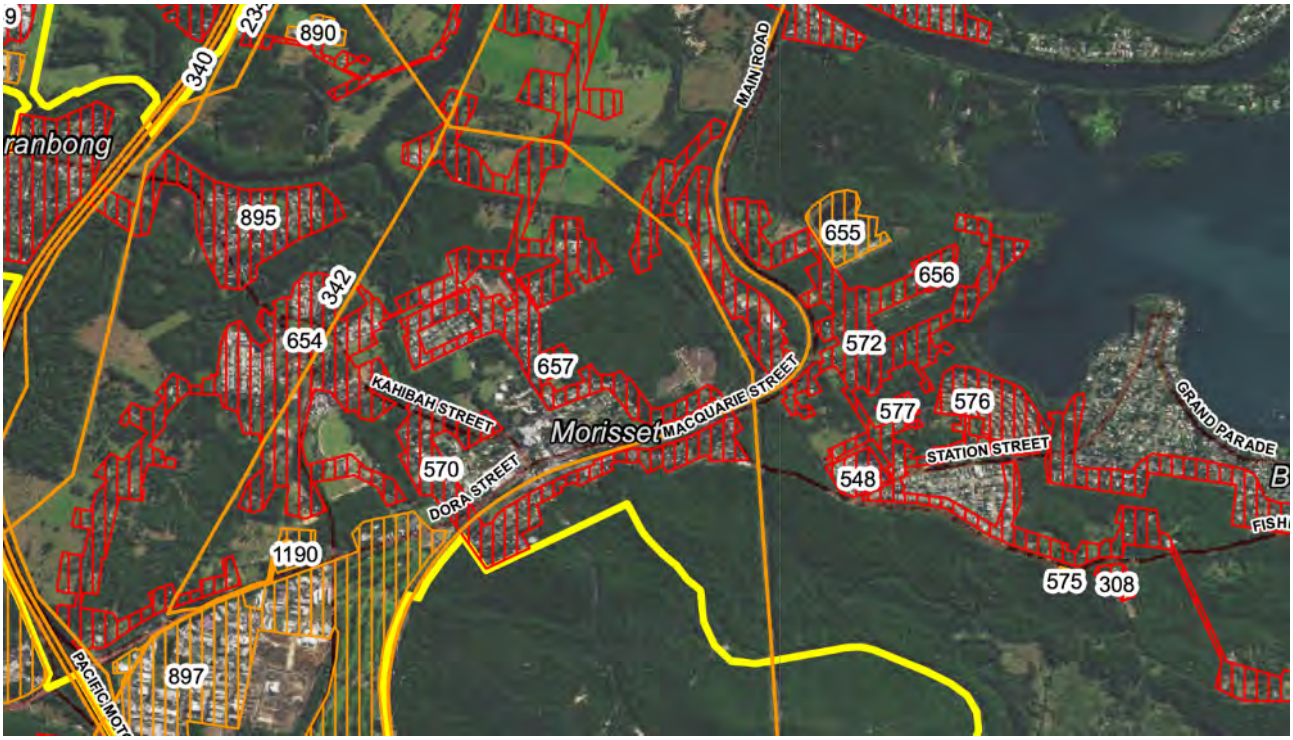


Figure 17: Extract from Central Coast Bush Fire Risk Management Plan

Table 6: Bush Fire Risk Management Plan assets and treatment types

	Asset name	Risk	Asset type	Asset sub type	Likelihood	Consequence	Treatment Number
657	Morisset Public School	High	Human settlement	Special Fire Protection Purpose	Possible	Major	15 APZ Hazard Reduction
570	Morisset Urban Residential	High	Human settlement	Residential	Possible	Major	14,15,17 LMZ Hazard Reduction APZ Hazard Reduction Preparedness - inspect and maintain fire trails
572	Morisset/Bonnells Bay Rural Residential	High	Human settlement	Residential	Possible	Major	14,15,17 LMZ Hazard Reduction APZ Hazard Reduction Preparedness - inspect and maintain fire trails
656	Heritage College	High	Human Settlement	Special Fire Protection Purpose	Possible	Major	14,15 LMZ Hazard Reduction APZ Hazard Reduction

654	Morisset Rural Residential	High	Human Settlement	Residential	Possible	Major	14 LMZ Hazard Reduction
342	Electricity Transmission Lines 132kV	Very High	Economic	Infrastructure	Possible	Catastrophic	19 APZ Hazard Reduction - infrastructure
897	Morisset commercial precinct & golf course	Medium	Economic	Commercial	Possible	Moderate	
1190	Morisset - substation	Low	Economic	Infrastructure	Unlikely	Moderate	

6.2 Neighbourhood Safer Places and Refuges

The interim report of the 2009 Victorian Bushfires Royal Commission identified that people need a range of options to increase their safety in the event of a bushfire (NSW RFS, NSP Guidelines). The following options are available:

- Community fire refuges
- Private Bush Fire Shelters
- Neighbourhood Safer Places
- Other Safer Locations

There are multiple Neighbourhood Safer Place (NSP) options within the area surrounding Morisset, although there is currently no NSP available within Morisset itself. Figure 17 below shows the locations of NSPs within proximity to the study area. The nearest options are situated at Arcadia Vale, approximately 14km away from Morisset in a northerly direction and Mannering Park, approximately 13.5km away from Morisset in a southerly direction. Both of these options require travel through bushfire prone vegetation and may be unreachable in the event of a bushfire. As an option of last resort, 14km is really too far to travel. It is also very possible that the NSPs shown in Figure 17 could already be occupied by the communities within which they are situated and have no room for residents from outside of that community.

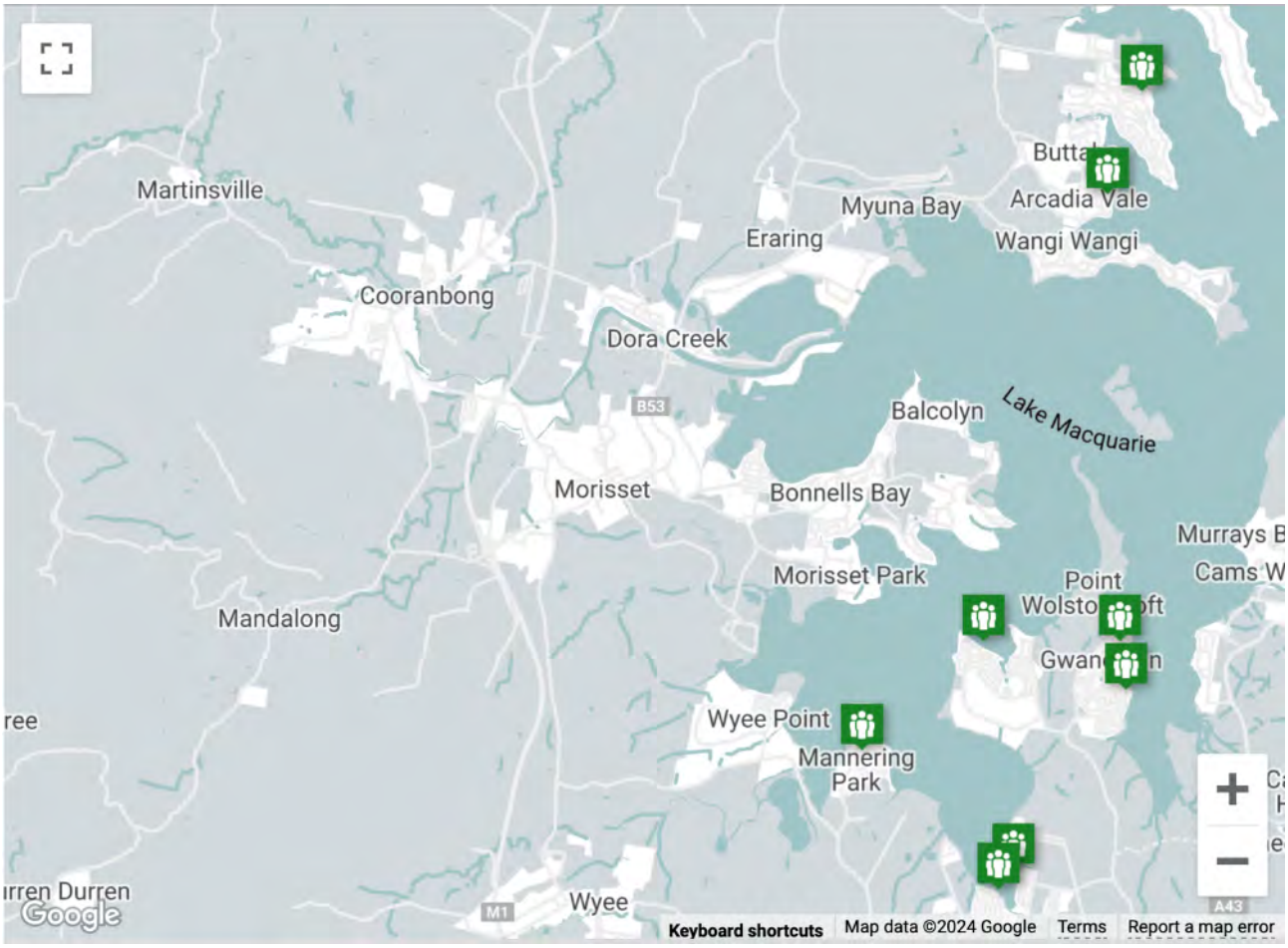


Figure 18: NSP in proximity to the study area (source: NSW Rural Fire Service)

The NSP is a place of last resort designed to assist people where there is imminent threat of bushfire and residents have no plan, or there is no option to carry out their plan due to conditions changing. The function of an NSP is only to provide a place to seek shelter during the passage of a fire front, they should not be relied upon as a primary protection option.

As bushfire could, in the worst case scenario, leave the urban area of Morisset isolated where road closures are in place, the provision of an NSP in Morisset is important and something that should be in place before new residential development occurs in the settlement. Although many residents will evacuate when advised to do so, a proportion will elect to stay and may realise, when it is too late to leave, that they are incapable of staying at the property. This is where an NSP is vital, to ensure that those people have somewhere to go whilst the fire front passes. However, the NSP is not necessarily a safe place, and is only a place to shelter. The NSW RFS provide the following advice regarding the use of NSPs:

- Travelling to an NSP is inherently dangerous due to the potential for traffic congestion, poor visibility, fire activity, traffic accidents or fallen trees that may block the route;
- People will need to use judgement and take appropriate action in regards to their personal safety while sheltering at a NSP
- Sheltering at a NSP may result in physical and/or psychological trauma;
- People are likely to experience extreme conditions including heat, high winds, fire noise, burning embers, radiant heat, smoke and ash while sheltering at an NSP;
- Access into a NSP may not be facilitated by emergency services and cannot be guaranteed;
- Emergency services may not be present;
- There is no provision for pets;
- There will generally be limited parking. Large numbers of vehicles may further compromise what little protection the area affords;
- There may be limited capacity with no amenities (e.g. food, drink, toilets will not be provided).
- There may be little or no capacity to help people with special needs.

- There is likely to be no communication or first aid facilities at an NSP

A building or open space must meet strictly low radiant heat thresholds to be suitable for allocation as an NSP. All NSPs require ongoing treatment by the landowner to ensure that the asset continues to meet the requirements and therefore NSPs are allocated risk treatment through the Bush Fire Risk Management Plan. This should be considered when allocating land or a built structure to the role of NSP.

The settlement of Morisset is relatively small and there are limited buildings or open space areas available for the provision of an NSP, it may therefore be appropriate to also look at the provision of community refuges within this area, particularly where they may be required as part of a mitigation package for new development. However, there are political issues around community refuges and there is general concern around the ways in which public funding is allocated to refuges. For example, if a refuge is offered in Morisset, the community may ask questions regarding the reasons why refuges have not been allocated to other communities. However, if the idea of a refuge forms part of the mitigation required to drive down the risk profile of a proposed community, such that it enables the development to occur then consideration of the refuge needs of other communities cannot form part of this assessment.

The operation and management of community refuges also needs to be very clear. As opposed to an NSP which is a place of last resort, a community refuge is designed to be a primary evacuation mechanism and can form part of the plans of residents in responding to potential bushfire. As such, the expectation is that the refuge will be manned and basic needs such as food, water and fire information will be provided. Funding needs to extend to resourcing of the refuge over at least the initial period of operation and then an understanding is required that long-term funding may be required to continue the operation of the refuge.

A recommendation is to determine whether there is an appropriate building available within Morisset that can support a community refuge. If a building is identified, this should form part of the development strategy and the funding of that building to operate as a refuge at time of bushfire should be funded by future development where a needs case can be established.

6.3 Emergency Resources

There are multiple NSW Rural Fire Service and NSW Fire and Rescue brigade resources within the local area. The closest facilities are Cooranbong Rural Fire Brigade, situated approximately 6km northwest of Morisset and Dora Creek Rural Fire Brigade situated on Newport Road north of Morisset, approximately 5.4km away. Other facilities which could be called on to respond to fires around Morisset include:

- Peninsula Rural Fire Brigade (approx. 6.8km)
- Mandalong Rural Fire Brigade (approx. 7.2km)
- Wyee Rural Fire Brigade (approx. 8.8km)
- Mannering Park Rural Fire Brigade (approx. 13.9km)

The study area lies within the Central Coast fire district and brigades within the area are directed by staff at the Central Coast Fire Control Centre in Charmhaven. The Central Coast area is known to be well-resourced, however, there will only be crews available to respond to the Morisset area if there are no significant fires already burning elsewhere within the region that have already had resources allocated to them. There may also be significant fires burning outside of the Central Coast District that have Central Coast resources allocated to them.

Morisset is a NSW Fire and Rescue area and there is a NSW Fire and Rescue station within Morisset situated on Newcastle Street in the centre of Morisset. This is an on-call fire station which means that staff are not situated on site but are notified by pager or phone call to respond to emergency events. Staff must reside close to the fire station.

Whilst there would appear to be resources available to respond to fire within the Morisset area, it is possible that those resources may be allocated elsewhere. There may be scope for an additional NSW Rural Fire Service Brigade within Morisset itself as there is no such Brigade available at the current time. Should new development occur, a potential location for a new NSW Rural Fire brigade might be along Fishery Point

Road on the outskirts of Morisset, close to site 11. This would provide strategic firefighting advantage close to this potential new community and could be funded through contributions collected during the approval process for new development in this location. Another potential location would be the west side of Morisset close to sites 1 and 8 or 2/3, this would provide an advantage in suppression on the west side where fires may burn towards Morisset itself.

Any provision of additional brigade resources would need to be justified based on the size of any proposed new community and the real need for additional firefighting resources. One way that contributions may work is by building a new building that can be transferred to Council for the provision of a new brigade.

7 Infrastructure

7.1 Water Supply

Infrastructure can be critical in the event of a bushfire, especially the reliability of the reticulated water system. The area is serviced by Hunter Water who report that water levels in the Hunter region drop faster than other Australian urban areas during hot, dry periods due to shallow water storages and high evaporation rates. Overall water storage in the area has dropped significantly in the past two years from 100% in April 2022 to approximately 85% today. One of the major sources of water to the region, the Grahamstown Dam, is currently at 87% of its storage capacity.

There is an expectation that the reticulated water system would be extended into any new development. In this location, it would not be appropriate to rely on static water supply given the bushfire risk in the area. However, additional static water would boost the potential for firefighting capability.

7.2 Electricity Supply

Black Summer highlighted the importance of power supply for emergency management and the continuation of telecommunications services. Telecommunications may operate well but during Black Summer, problems with the power supply meant telecommunications were unable to operate. Electricity supply is therefore paramount.

One of the major lessons learnt during Black Summer was that timber power poles were significantly impacted by fire. Telecommunications were also therefore affected due to timber power poles being destroyed. There was also a lack of supply of replacement power poles following the fire events, which meant that electricity restoration was significantly delayed. This also resulted in a slowed down pace of recovery following the fires.

In order to ensure continuity of power supply, timber power poles should not be used within any new development. Instead, non-combustible power poles should be utilised. This is a provision that can be written into the Development Control Plan for the region and has the benefit of ensuring ongoing electricity supply for firefighting and emergency operations, electricity supply for ongoing telecommunications and easier recovery following fires. This is a significant provision that improves life safety for both existing and proposed communities.

There is an electrical easement traversing the study area. There is a bushfire risk from potential sparks from the power lines. This would be a rare circumstance, but one which has occurred in other locations in the past and has been destructive, for example the Linksview fire in 2013. Power line easements are generally managed as asset protection zones by the electricity company under industry guidelines and regulations, and the electricity easement is identified as both an asset and an asset protection zone within the Bush Fire Risk Management Plan. The mitigation strategies proposed within this document apply to bushfires which ignite under any circumstances and would provide protection to both the existing and proposed community in the event of a bushfire caused by a powerline issue.

The potential residential development of Site 11 will need to consider the proximity of power lines and the operational challenges in ensuring access to the power line easement for maintenance of the asset protection zone. The probability of bushfire igniting is slightly increased around power lines. Sufficient asset protection zones will therefore need to be provided within any ultimate residential development of the land to ensure the risk from power lines sparking is mitigated, along with the wider landscape bushfire risk. An option for ensuring the risk to both new and existing residential areas is reduced would be to require that power poles within a certain distance of development are replaced (where necessary) with new, non-combustible power poles.

Power line easements can make firefighting more challenging due to the safety requirements of working around power lines. This would need to be considered by the Local Emergency Management Committee and would be included in any operational firefighting strategy.

8 Adjoining Land

The existing community is already exposed to a high level of bushfire risk, being on the interface of a bushfire prone landscape, and experiencing potential for isolation from other communities in the area in the event of a bushfire.

Should the development of some or all of the sites within the Place Strategy occur, it would serve to move the interface of the community with the bushfire prone landscape closer to the vegetation and expose a greater overall number of people to the risks. This issue needs to be weighed up with the ability to provide mitigation to the proposed communities to offset some of the risks and improve the overall protection provided.

The existing community would be at increased risk if the introduction of new people were to adversely impact existing bushfire mitigation activities or access/egress for the existing community. The traffic situation within Morisset is already congested and network upgrades are required to relieve this congestion in the event of an emergency. The introduction of new communities into this transport environment would definitely increase the risk to the existing community, unless the road upgrades required are realised prior to development of the sites in question. Residents situated further from the bushfire risk may not need to leave and some residents prefer to stay at home in the event of a fire. The roads would not therefore need to accommodate the entire population, but would need to support the movement of large numbers of people in a bushfire emergency.

The firefighting need will be moved to the interface of the proposed development with the hazardous vegetation and there would be less need for resources to be deployed to the existing interface. There may be pockets of vegetation remaining within the existing interface, dependent upon development plans and the need to retain corridors of vegetation within any new community, which may require an emergency management resource. The need for emergency management resources will therefore increase, but it is anticipated that this increase will be marginal.

Providing the proposed development can be mitigated such that the risk to the proposed community is "as low as reasonably practicable", the impact of the proposed development of each of the sites on the bushfire risk and response of the existing community is minor. Upgrading the road network such that there is no impact on the existing community within an emergency evacuation scenario is critical to achieving this.

9 Environmental

There are environmental constraints within the study area which may have an impact on the ability to provide bushfire protection measures in any new development. The Place Strategy Discussion Paper describes the areas with high ecological values are shown in Figure 18 below.

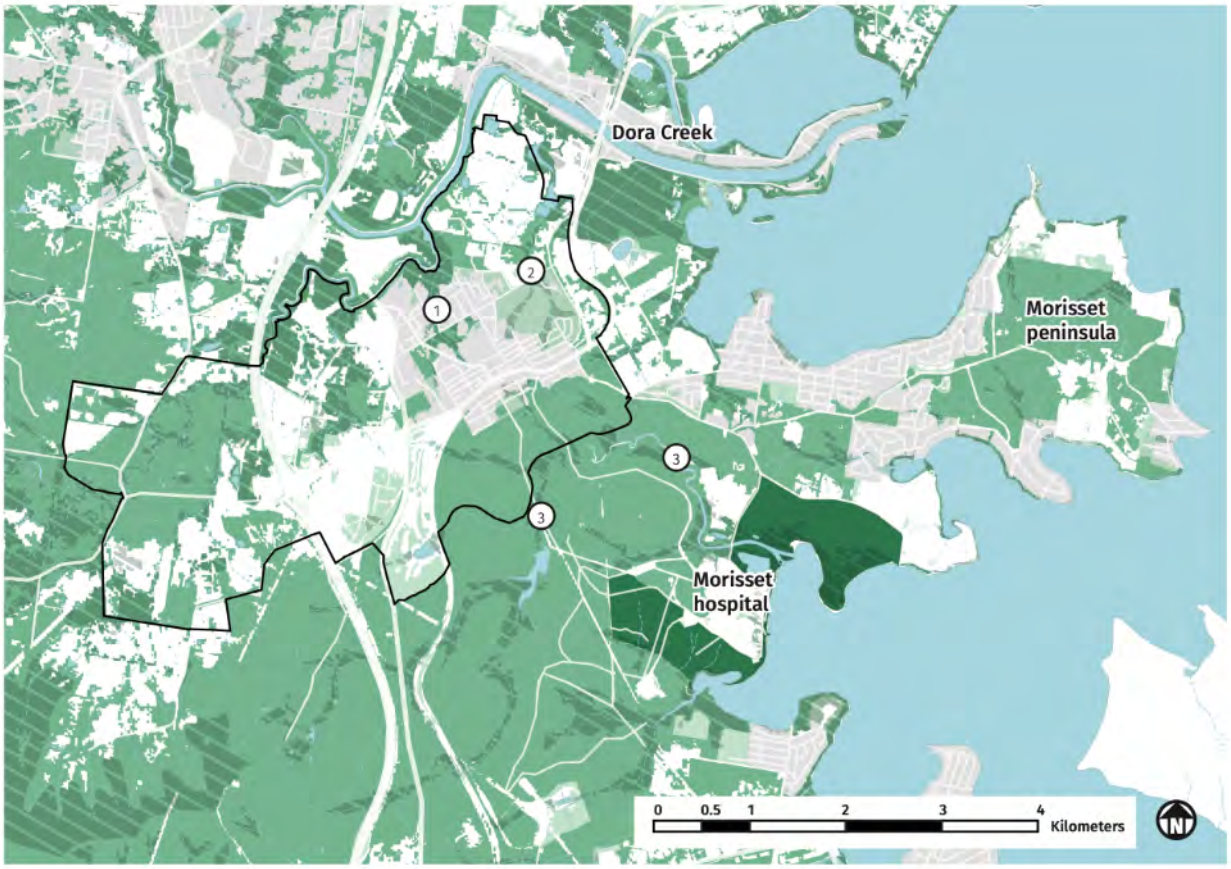
Within the study area there are two sites of ecological value – Clacks Creek Riparian Corridor and Melaleuca Creek Riparian Corridor. The Clacks Creek Riparian Corridor does not impact on any of the sites within the subject area. The Melaleuca Creek Riparian Corridor could potentially impact the residential development of Site 4. Development within Sites 5, 6 and 7 may also need to respect the ecological value of this creek line. The Place Strategy Discussion Paper describes the creek as providing a critical link for fauna from bushland north of Dora Creek to the Lake Macquarie Conservation Area south of Morisset. Any bushfire risk remaining within this riparian corridor would need to be taken into consideration in the residential development, particularly of Site 4.

Lake Macquarie State Conservation Area is the area of the most significant ecological values in and around the Morisset area. One of the Additional Investigation Areas, The Morisset Hospital site, is in close proximity to this Conservation Area. The significance of this conservation area would impact upon the ability to provide asset protection zones for any new development and the retention of vegetation of significant ecological value is likely to result in a high level of bushfire risk.

Much of the vegetation along the Morisset Peninsula is of high ecological value. This may impact development potential of sites along the peninsula, particularly for residential development, where ecological values and bushfire protection requirements may conflict.

Areas of land surrounding site 11 and sites 1, 2, 3, 5, 6, 7 and 8 include high ecological value areas with sites 1, 2, 3 and 8 also including pockets of Threatened Ecological Communities. In these areas it is likely that some vegetation would be retained within a development layout and that there might be conflict in creating asset protection zones. The land at Site 11 should only be released for residential development where it is clear that a development layout can be provided which incorporates the asset protection zones required by *Planning for Bush Fire Protection* as a minimum. There may also be need to incorporate additional asset protection to take into consideration a climate change factor as discussed in Chapter 3 above. The retention of any vegetation within a future development layout would need to be taken into account in the calculation of bushfire risk for the properties within the development. Retained corridors of vegetation were seen to have a significant impact on properties during Black Summer and it is important that this is mitigated for in future development.

The need to retain significant or threatened vegetation has less of an impact on commercial, industrial or agricultural development, but nevertheless should still be considered in deciding whether this is an appropriate area for the land uses proposed. Asset protection zones will be required for any buildings of a commercial or industrial nature, in a similar way to those required for residential development.



ECOLOGICAL VALUE

- Lake Macquarie State Conservation Area
- High ecological value outside of development areas.
- High ecological value within areas that may be developed
- Threatened Ecological Communities (BC and EPBC Act)
- Morisset regionally significant growth area

1. Clacks Creek riperian corridor
2. Malaleuca Creek riperian corridor
3. Pourmalong Creek riperian corridor

Figure 19: Ecological Value around the study area (source: Morisset Place Strategy Discussion Paper)

10 Conclusions and Recommendations

10.1 Identified Risk

The bushfire risk within the landscape around Morisset is significant. The combination of wet sclerophyll forest to the west and steep slopes leads to a significant potential threat under the worst bushfire weather conditions – hot dry north westerly winds. The fire risk continues into the study area through remnant corridors of forest and forested wetland, along with unmanaged grassland within the study area.

The risk to the south of the study area is also significant with dry sclerophyll forest leading right up to the urban interface. Under southerly wind conditions, or a southerly wind change, fire could transfer into the southern section of Morisset. The evacuation risk is a significant challenge when considering new development within the study area. Existing levels of congestion would need to be overcome before considering new development. From an emergency management perspective, having a road network that allows for swift evacuation whilst emergency services are attending is critical.

The lower risk areas of the study area are in the northern parts of the urban area, where vegetation is more riparian in nature and is mainly grassland and freshwater wetland, along with some forest and forested wetland along riparian corridors. This area is more isolated from the existing urban area, with one road in and out. Road network improvements would be required to ensure two directions of travel are possible away from this area and any approaching fires.

The Morisset Peninsula includes significant pockets of dry sclerophyll forest interlaced with urban areas. There is concern that under the right weather conditions, fire could transfer along the peninsula, causing significant issues for evacuation as most roads traverse through bushfire prone vegetation. There are environmental conservation requirements in this area which would need to be balanced carefully with bushfire protection needs. The intensification of land use along the peninsula would lead to multiple additional vehicle trips in an emergency scenario and an emergency traffic study would be required before releasing land in this area, particularly for residential development.

The Morisset Hospital and Waterfront site is surrounded by bushfire prone vegetation, part of which is the Lake Macquarie State Conservation Area. The site is susceptible to fires from the west, north and south which could travel and build in intensity through the fire prone landscape. The site is isolated within the landscape and access roads traverse through bushfire prone vegetation which is likely to lead to people in this area becoming trapped in the event of a bushfire.

10.2 Development Potential

The western side of the study area is subject to the greatest potential bushfire risk, the introduction of industrial or commercial uses on this side of the study area is more appropriate than residential development. If intensive agricultural uses are proposed alongside other industrial or commercial uses, the potential fire risk emanating from this use should also be assessed in detail. The proximity of the M1 Pacific Motorway and ease of access to the motorway is a significant advantage in evacuating sites. For any future use, the number of proposed occupants in an area of significant bushfire risk will be a consideration, along with the ability to swiftly evacuate occupants away from any fast-moving bushfire. The application of asset protection zones will also assist in gaining additional time for evacuation, these may need to be greater to allow for a climate change factor.

Residential development within the existing urban area of Morisset is appropriate, providing any road network congestion issues can be overcome. Evacuation potential needs to take account of existing retirement and aged care facilities within the existing area and the desire for new retirement and aged care facilities as additional evacuation support may be required in these areas. New development will need to include more than one access route away from any approaching bushfire, perimeter roads and asset protection zones large enough to account for future climate conditions. The retention of any vegetation within development sites needs to be included within any detailed bushfire risk assessment and mitigation strategy.

Site 11 which is identified for potential future residential development is the site with the greatest concern due to both the bushfire risk from the south and the congestion issues within Morisset. For this site to be considered for residential development, a significant mitigation strategy must be developed. The strategy should consider measures such as the registration of strategic fire trails, the inclusion of greater asset protection zones than those ordinarily required, a minimum level of bushfire protection construction across the precinct, a significantly upgraded road system which includes perimeter roads and the inclusion of places of refuge and places of last resort.

The Eastern side of Morisset and the Morisset Peninsula are subject to pockets of significant bushfire risk and share similar road network issues to the main urban area of Morisset. Residential development along this road should be treated with caution and would need to be subject to a full emergency evacuation assessment. There is significant bushfire risk to existing communities along the peninsula with limited opportunities available for shelter or refuge. Adding additional people into this area will exacerbate this risk. Recreation uses which attract additional visitors to the area will also require detailed consideration to ensure those functions can be evacuated. The need for environmental management along the peninsula may reduce the ability to provide effective mitigation through asset protection and vegetation management.

The Morisset Hospital and Waterfront site is subject to significant landscape risk and is in an isolated location. Residential development should not be considered here or in the RU6 area to the north of the hospital due to the risk. Recreation uses may be appropriate, emergency management will need to focus around the anticipated number of visitors and the ability to evacuate the site in an orderly fashion, keep people on site for shelter, or close the facility in anticipation of fire activity.

Overall, for any site within the study area to be considered for development, detailed studies of the bushfire risk and evacuation potential will need to be undertaken. The sites within the existing Morisset urban area have the best potential for residential development, but the road congestion within the area is a concern. The impact of additional people entering the road network to evacuate in the event of a bushfire on the existing community is a key consideration. The sites in the west of the study area should not be considered for residential development, but industrial and commercial uses are acceptable, subject to the development of emergency management plans for individual facilities.

10.3 Concluding Remarks

The bushfire risk in this location has been determined to be very high, this is exacerbated by the potential for traffic congestion which could cause problems in a bushfire emergency scenario. In order to move towards the principle of reducing the risk to "As Low As Reasonably Practicable" and allow development to move forward on a more 'tolerable' or 'appropriate' risk level, a number of mitigation actions are required to be delivered through a future planning framework. Due to the evacuation challenges, robust delivery mechanisms are required to ensure that development does not proceed without full mitigation in place.

The following is a list of mitigation actions recommended to reduce the risk level of the development and increase the resilience of the existing and future communities:

- **Road network capacity** – further investigations should be carried out into the capacity of the surrounding road network to support evacuation during a bushfire event. The investigations should evaluate the percentage of the existing and proposed population that are likely to require evacuation in potential bushfire scenarios.

- **Minimising isolated development** – residential 'islands' or any development without good connectivity for firefighting access or occupant evacuation should be avoided. One of the subdivision objectives of Planning for Bush Fire Protection 2019 is to "Minimise the perimeter of subdivision exposed to the bush fire hazard". There are multiple reasons why the minimisation of the size of the hazard interface is important:
    - The number of people directly exposed to the hazard is reduced.

- Firefighter exposure to the hazard is reduced.
- Ongoing mitigation costs are reduced.
- Ongoing mitigation resourcing is reduced.
- Connectivity with existing urban area is maximised.

- **Road connectivity**– opportunities to connect any newly proposed development to existing development should be maximised for both firefighting and evacuation purposes.

- **Asset protection zones** – an asset protection zone (APZ) is designed to minimise fuel loads and reduce potential radiant heat levels, flame, localised smoke and ember attack (PBP 2019). The APZ can slow the onset of fire and provide additional time for residents to evacuate and firefighters to operate suppressing spot fires. Due to the high bushfire risk within the subject location, the maximisation of APZ opportunities is recommended as follows:
  - Private APZs within resultant residential lots reflect potential future climate conditions. APZs currently required by PBP 2019 for residential subdivision will be extended to reflect a climate change assessment.
  - Building within perimeter residential lots to be limited on title at subdivision stage to a maximum BAL-29 distances (including the climate change assessment). Building will not be permitted at BAL-40 or BAL-FZ within future residential lots.

- **Strategic fire trail** – opportunities to formalise any of the fire trails surrounding the study area should be investigated. Particularly in relation to the potential development of Site 11 for residential development. Multiple fire trails exist within the landscape surrounding that site. Registration of strategic fire trails within this location provides strategic advantage for both firefighting and hazard reduction activities.

- **Minimum BAL level** – a mechanism to achieve a minimum bushfire construction level should be investigated. An example might be that all dwellings constructed within the study area are built to a minimum construction level of BAL-12.5 regardless of their calculated BAL at the time of building Effectively, this results in no houses within the study area being built to BAL-Low. This would provide a minimum protection against ember attack and low levels of radiant heat impact across the study area.

- **Power supply** – all new electricity supply should be underground to avoid power supply failure during a bushfire event. This should be investigated before any other power supply option is explored. As a minimum, any new above-ground electricity infrastructure should be resilient, i.e. power poles should be non-combustible. Any new Special Fire Protection Purpose facilities, such as aged care facilities, should have a backup power supply to allow continuous use of the facility during a bushfire event if required.

- **Water supply** – there should be no reliance on static water supply within the proposed development. There is good water supply available within the area and the existing reticulated system should be extended into the new development. Any static water supply should be in addition to this reticulated system.

- **Vulnerable uses** – any new Special Fire Protection Purpose uses should be located as close as possible to the existing development, or well within new urban areas, and not on the new urban/bushland interface.

- **Refuge** – suitable locations for refuge should be explored within the study area. The goal must be to create a road network within the study area that can support an evacuation. However, the introduction of a community refuge would provide an additional evacuation option and, given the current challenges in travelling around the study area, this would be beneficial. If it is concluded

that a refuge is required, a mechanism for the guaranteed delivery of that refuge and the operating characteristics will need to be identified. One mitigation option may be to enhance an existing building within the study area such that it operates with some refuge functionality, e.g. water supply and information provision.

- **Neighbourhood Safer Place (NSP)** - as a minimum, the introduction of an NSP within the study area would provide a place of last resort that can be reached by residents within the study area. An option may be to identify an existing building within the study area that can be used as an NSP. Signage and messaging around the use of the NSP needs to be clear.

- **Vegetation Management Plan** – any vegetation which is to be retained within proposed development sites must be subject to a VMP which considers both biodiversity and bushfire management. Where bushfire management of vegetation within the urban area is not possible, BAL levels of new development must be calculated to ensure that construction and asset protection zones reflect the risk from the vegetation.

- **Existing community resilience and ongoing management** – there is significant opportunity to enhance the resilience of the existing community through contributions for community education regarding the ongoing maintenance of residential bushfire protection measures. Contributions could also fund the optional ember protection of unprotected residences on the existing bushland interface. Although some development might effectively move the interface further into the landscape, there remains a bushfire threat to the existing interface through pockets of remaining vegetation. Providing ember protection, such as fly screens and draught excluders to these properties would assist in increasing the overall resilience of the community. This could also extend to providing funds to upgrade any existing properties remaining on the interface to the appropriate BAL.

- **Staging** - Staging of any future development must ensure appropriate bushfire protection provided throughout. Access connections must be created ahead of house building. Vegetation management and APZs must occur throughout staging. No dwelling must be built prior to appropriate protection being in place. This is particularly true when understanding road network capacity through staging of development.

- **Bush Fire Risk Management Plan Review** – the Local Emergency Management Committee (LEMC) must be informed of any future Place Strategy such that they can be aware of any potential operational challenges created by new development. The LEMC must have the ability to comment on the proposed Place Strategy if they so wish.

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